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FMC Idaho LLC, Pocatello, Idaho

**REMEDIAL DESIGN
DATA GAP REPORT
for the FMC OU**

January 2014

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ACRONYMS/ABBREVIATIONS

ASTM	American Society of Testing and Materials
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm/sec	centimeters per second
DGWP	Data Gap Work Plan
EPA	U.S. Environmental Protection Agency
ET	evapotranspirative
ft	feet
in.	inch
IRODA	Interim Record of Decision Amendment
LL	liquid limit
meq	molar equivalent
MDD	maximum dry density
mg/kg	milligrams per kilogram
mmhos	micromohs
OMC	optimal moisture content
OU	operable unit
lbs/ft ³	pounds per cubic foot
PI	plasticity index
PL	plastic limit
RA	remediation area
RAO	remedial action objective
RDRA	Remedial Design/Remedial Action
RDWP	Remedial Design Work Plan
SB	soil boring
SFS	Supplemental Feasibility Study
SRI	Supplemental Remedial Investigation
TCLP	Toxicity Characteristic Leaching Procedure
TP	test pit
UAO	Unilateral Administrative Order
WUA	Western Undeveloped Area

1.0 INTRODUCTION

As specified in the *Interim Amendment to the Record of Decision for the EMF Superfund Site FMC Operable Unit* (IRODA; EPA 2012), the selected soil remedy for the FMC OU includes the construction of soil covers over specified remediation areas (RAs). Two soil cover designs are specified: gamma cap and evapotranspiration (ET) cap. The preliminary designs for these soil covers are summarized below:

- The ET soil cover design consists of a minimum cover thickness of 24 inches of soil that will provide sufficient water storage and an additional 6 inches of soil to address potential long-term erosion of the cover. The design basis is presented in the *Comparison of Conventional and Alternative Capping Systems for Use at the FMC Plant OU (Capping Memorandum)* contained in Appendix D of the *Supplemental Feasibility Study Report for the FMC Plant Operable Unit (SFS Report, MWH, 2010)*.
- The gamma soil cover consists of a nominal 12 inches soil and is expected to provide sufficient gamma shielding from underlying fill materials. As described in the Remedial Design Work Plan (RDWP; MWH, 2013a), a gamma cap performance evaluation will be detailed in the separately-submitted Gamma Cap Performance Evaluation Work Plan.

The selected remedy requires approximately 155 acres of ET soil covers and 340 acres of gamma soil covers. The soil to be used for construction of both types of covers will be removed from the Western Undeveloped Area (WUA), an area of the westernmost portion of the FMC Plant OU that was never used in the phosphorus manufacturing process. Additional site-specific soil data from the WUA is required to proceed with cover design. This report details the additional soil sampling and material (geotechnical) testing that was performed to better define the volume of available borrow soil and its material properties to finalize the design of the soil covers.

As specified in the IROD, the selected groundwater remedy for the FMC OU includes groundwater extraction and treatment, with treatment either at the City of Pocatello POTW or by a water treatment facility built within the FMC OU. The latter alternative would discharge treated water to an infiltration basin, from which it would either percolate down to groundwater or evaporate to the atmosphere. FMC is evaluating both of these treatment options. This report describes the collection of soil percolation data that was performed to support the evaluation and potential design of the onsite percolation/ evaporation basin(s).

Another remedial action requirement of the IROD is that elemental phosphorus residues that may remain in underground 16-inch, reinforced concrete storm/sewer piping in RA-A must be removed and disposed of offsite. This report presents the procedures used to perform a video survey of that underground storm drain piping to better understand the volume of residual solids it contains and support design of this element of the remedial action.

1.1 REGULATORY BACKGROUND

On June 10, 2013, EPA Region 10 issued a Unilateral Administrative Order to FMC for Remedial Design and Remedial Action (UAO for RD/RA, or UAO; EPA 2013), EPA Docket No. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-10-2013-0116. The UAO for RD/RA requires FMC to implement the interim remedial actions that EPA selected in its September 27, 2012 Interim Record of Decision Amendment for the FMC OU (“IRODA”). FMC is implementing the selected remedy in accordance with the UAO.

As summarized in Section 3 of the RDWP a data gap investigation was performed between October 29th to November 13th, 2013 to collect site specific data to support the RD as defined in of Section IX, Paragraph 30 a. and 30 b. of the UAO. This Data Gap Report summarizes the investigations performed and testing completed in accordance with the Data Gap Work Plan (DGWP; MWH, 2013b) that was approved by EPA on XXXXX.

1.2 FMC SITE DESCRIPTION

A description of the FMC OU is presented in Section 2 of the RDWP. A site map showing the FMC OU RAs and WUA is provided on Figure 1-1.

1.3 PURPOSE AND SCOPE OF REPORT

This report has been developed to provide the following:

1. Summarize the site investigations and material testing performed as per the DGWP;
2. Present the results of soil testing performed on samples collected from the WUA, including properties (geotechnical, hydrological, agronomical, vegetative) to support design of the ET soil covers and evaluate potential design of the infiltration basin option for managing treated groundwater;
3. Provide an estimate of the availability of borrow soil within the WUA for cap construction;
4. Present the results of the RA-A stormwater sewer survey; and
5. Provide an estimate of the root density expected based on the vegetation trial plot survey.

1.4 DOCUMENT ORGANIZATION

The remainder of this Work Plan consists of the following:

- Section 2.0 Data Gap Field Investigations – Presents a summary of the field investigations performed per the DGWP.
- Section 3.0 Laboratory Testing – Presents a summary of the laboratory testing performed on samples collected during the field investigation.

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- Section 4.0 Data Gap Investigation Results – Presents the results of the field investigation, including a summary of soil property testing, root density testing, and the stormwater sewer video survey.
 - Section 5.0 contains references.
 - Appendix A: Field Investigation Photographs
 - Appendix B: Test Pit Logs
 - Appendix C: Soil Boring Logs
 - Appendix D: Geotechnical and Hydrological Testing Reports
 - Appendix E: Agronomic Testing Reports
 - Appendix F: Root Density Testing Reports
 - Appendix G: RA-A Stormwater Sewer Decontamination Waste Determination Laboratory Reports and DVD of Video Survey
 - Appendix H: ProUCL 5.0 Statistical Analysis

2.0 DATA GAP FIELD INVESTIGATIONS

A variety of field investigations were performed during October 29th to November 13th per the DGWP and included the following:

- Excavation of 10 test pits within the WUA;
- Drilling of 5 soil borings within the WUA;
- Video survey of stormwater sewer piping in RA-A; and
- Collection of soil samples from the FMC vegetation trial plot.

A description of the above investigations is provided below. Photographs taken during the field investigations are presented in Appendix A.

2.1 WESTERN UNDEVELOPED AREA INVESTIGATIONS

A focused investigation was performed in the WUA consisting of test pits and soil borings. Test pit and soil boring locations are presented in Figure 2-1 and a summary of the investigations are presented in Table 2-1. Test pit and soil boring logs from the WUA are presented in Appendix B and C, respectively.

Table 2-1 Summary of WUA Soil Investigation

Test Pit/Soil Boring I.D.	Total Depth (feet bgs)	Depth of Gravel (feet bgs)	Sample Depths/Intervals
TP001	15.7	15.7	Grab samples collected at 1 foot intervals down to 10 feet.
TP002	17.3	NC ^{a/}	Grab samples collected at 1 foot intervals down to 10 feet.
TP003	4	4	Grab samples collected at 1 foot intervals down to 10 feet.
SB003	31.5	2.0	Undisturbed sample collected at 0 to 2 feet (bgs).
TP004	18	NC ^{a/}	Grab samples collected at 1 foot intervals down to 10 feet.
SB004	31.5	23.5	Undisturbed samples collected at 2 to 4 and 6 to 8 feet (bgs).
TP005	20.5	NC ^{a/}	Grab samples collected at 1 foot intervals down to 10 feet.

Test Pit/Soil Boring I.D.	Total Depth (feet bgs)	Depth of Gravel (feet bgs)	Sample Depths/Intervals
TP006	17.1	NC ^{a/}	Grab samples collected at 1 foot intervals down to 10 feet.
SB006	31.5	21.1	Undisturbed samples collected at 2 to 4, 6 to 8 feet (bgs).
TP007	19.8	NC ^{a/}	Grab samples collected at 1 foot intervals down to 10 feet.
SB007	31.5	24.5	Undisturbed samples collected at 2 to 4, 6 to 8, and 12 to 14 feet (bgs).
TP008	19.8	NC ^{a/}	Grab samples collected at 1 foot intervals down to 10 feet.
SB008	31.5	30.0	Undisturbed samples collected at 2 to 4 and 6 to 8 feet (bgs).
TP009	12.3	7.5	Grab samples collected at 1 foot intervals down to 10 feet.
TP010	9.0	6.0	Grab samples collected at 1 foot intervals down to 10 feet.

Notes:

^{a/} NC = gravels not contacted in test pit

2.1.1 Test Pits

A total of ten (10) test pits (TP001 through TP010) were excavated throughout the WUA. Grab soil samples were collected from each test pit at approximately 1-foot intervals down to 10 feet and composited to provide 2 5-gallon buckets of representative soils from each location per the Work Plan. The test pits were excavated to various depths ranging from 7 to 20 feet below ground surface. Soils encountered in the test pits were predominantly loess silt (silt) overlying gravels. The depth of silts ranged from 4 to 20 feet deep with the majority of test pits encountering silt down to at least 15 feet. Depth measurements were completed at the base of the test pit and in any test pits where gravels were contacted.

2.1.2 Soil Borings

Five soil borings (SB003 through SB007) were collocated within 20 feet of five test pit locations (TP003, TP004, TP006, TP007, and TP008) and drilled to a total depth of 31.5 feet. The purpose of the soil borings were to collect undisturbed samples of the silt, to characterize the general depth of gravels underlying the silts, and collect disturbed samples of the gravel. Undisturbed samples of the silts were collected using a Shelby tube at depths of 2 to 4-feet and 6 to 8-feet with one sample collected at 12-14 feet. The sample at 12-14 feet was collected to provide additional information related to the in-situ hydraulic conductivity of the silts at deeper depths. In addition, one grab sample of the gravels contacted in TP003 was collected for laboratory permeability analysis. Based on visual observation, the underlying gravels size was predominantly 3-inch minus and were metamorphic in nature. In addition to the samples of the gravels, undisturbed samples were collected from specific soil borings.

2.2 STORMWATER SEWER SURVEY

2.2.1 Background and Objectives

Historical information gathered during the Supplemental Remedial Investigation (SRI) indicated that the subsurface stormwater piping located in RA-A had carried stormwater runoff and process materials from the furnace building and phos loading dock (RA-B) to the railroad swale (RA-K). These process materials consisted of wash waters that were suspected of containing ore, slag, precipitator slurry, and phossy water (containing elemental phosphorus). However, it was not known if these materials were still present in the underground stormwater piping and to what extent. The selected remedy (Soil Alternative 3) prescribed that the underground stormwater sewer piping within RA-A (to be capped with a gamma cap) be cleaned out to remove any process materials that could present a threat to groundwater or future site workers (i.e., elemental phosphorus, metals, and radionuclides).

A video survey of the subsurface stormwater piping located in RA-A was conducted to determine the approximate volume of accumulated solids within the piping (with the potential presence of P4) and to estimate the amount of material (sediments) that will require removal, characterization, and disposal. The subsurface stormwater sewer piping included in the video survey is presented in Figure 2-2. Although the cleaning of the stormwater sewer piping as specified in the selected remedy was limited to the piping within RA-A, an attempt will be made to clean all of the stormwater sewer piping as shown in Figure 2-2 during the remedial action. If cleaning of any piping segment is not possible due to physical constraints, the ET cap over RA-B will be extended to cover the uncleared segments. Also, any stormwater piping which extends under an ET cap will be plugged with concrete to prevent water migration through the piping under the ET cap.

2.2.2 Video Survey Description

The stormwater sewer video survey was performed on November 6, 2013. The video surveillance utilized a remote control robotic camera that was lowered down into the piping through existing drain inlets, manholes and discharges. This technology is typically used on underground sewer piping that has been cleaned prior to the survey. Results of the video survey were very useful, but limited due to the inability of the robotic camera to proceed through 16-inch piping that was partially full of sediment and did not fit in the 8-inch lines. A DVD of the survey video is included in Appendix G. A summary of the video surveys is presented below with the surveyed piping segments shown on Figure 2-2:

- **The piping segment from west discharge pipe toward Area Inlet #4** - This piping segment consists of a 16-inch concrete pipe from the west discharge into the railroad swale (RA-K) toward the Area Inlet #4 (about 129 feet total length). This segment was about 50% full of sediments at the discharge and there was not sufficient headspace to send the robotic camera into this piping. The sediment as observed from the end of the west discharge pipe appeared to consist of ore, slag, and native soils. There was no evidence of P4 in the sediment.
- **The piping segment from Area Inlet #4 toward the west discharge pipe** – This piping segment is the same as described above. An attempt was made to send the robotic camera in the reverse direction from Area Inlet #4 toward the west discharge pipe. The robotic camera was only able to travel about 2 feet before becoming stuck in the sediment. The sediment as observed from the robotic camera and from decon of the robotic camera appeared to consist of ore, slag, and native soils. There was no evidence of P4 in the sediment. This pipe as observed from Area Inlet #4 was greater than 50% full of sediments.
- **The piping segment from east discharge pipe toward Area Inlet #1** - This piping segment consists of a 16-inch concrete pipe from the east discharge into the railroad swale (RA-K) toward the Area Inlet #1 (about 85 feet total length). This segment was surveyed with the robotic camera. The first half of the pipe was relatively clean from the east discharge until about 40 feet into the pipe. The pipe was about 10 to 20% full of sediment the remainder of the distance to Area Inlet #1. The sediment as observed from the robotic camera and from decon of the camera appeared to consist of ore, slag, and native soils. There was no evidence of P4 in the sediment.
- **The piping segment from Area Inlet #4 to Area Inlet #3** - This piping segment consists of a 16-inch concrete pipe from the Area Inlet #4 to Area Inlet #3 (about 107 feet total length). An attempt was made to send the robotic camera from Area Inlet #4 toward Area Inlet #3. The robotic camera was not able to travel down this segment due to the sediment. The sediment as observed from the robotic camera and from the decontamination of the robotic camera appeared to consist of ore, slag, and native soils. There was no evidence of P4 in the sediment. This pipe as observed from Area Inlet #4 is assumed to be 100% full of sediments.
- **The piping segment from Area Inlet #4 to Area Inlet #2 and Area Inlet #5** - These piping segments consists of 8-inch steel piping from the Area Inlet #4 to Area Inlet #2 (about 170 feet total length). A separate 8-inch steel pipe branches off from this segment

toward Area Inlet #5 (about 180 feet total length). As the robotic camera could not pass through an 8-inch pipe, an attempt was made to send a cable camera from Area Inlet #4 toward Area Inlet #2 and Area Inlet #5. The cable camera was not able to travel down these piping segments due to the sediments in the pipes and access restrictions. The sediment as observed from the cable camera and from decon of the cable camera appeared to consist of ore, slag, rust, and native soils. There was no evidence of P4 in the sediment. These pipes as observed from Area Inlet #4 are assumed to be 70% full of sediments.

- **The piping segment from Manhole #1 to Area Inlet #3** - This piping segment consists of a 16-inch concrete pipe from Manhole #1 to Area Inlet #3 (about 169 feet total length). The robotic camera was sent from Manhole #1 toward Area Inlet #3 and traveled about 55 feet before being blocked by sediment. The sediment as observed from the robotic camera and from decon of the robotic camera appeared to consist of ore, slag, and native soils. There was no evidence of P4 in the sediment. This pipe as observed from Manhole #1 is assumed to be 50% full of sediments.

2.2.3 Equipment Decon and Waste Determination

After each segment was surveyed (or attempted to be surveyed), the robotic camera or cable camera were decontaminated as removed from the piping. The cameras and cables were decontaminated using water and brushes to mechanically remove the contaminants. The decon water was collected in a plastic drum. The removed materials appeared to be primarily ore, slag, and native solids. There was no evidence of P4 (i.e., no observed smoking). The decon water and sediments were separated and sent to a laboratory for waste determination analysis. The results of the analyses are presented in Appendix G. Based upon observations, process knowledge, and the laboratory analyses, the decon water and sediments removed from the video equipment were determined to be non-hazardous and were managed pursuant to the Work Plan.

Findings and conclusions of the video survey are presented in Section 4.4.

2.3 VEGETATION TRIAL PLOT SAMPLING

In order to provide site-specific information associated with root depth and density, sampling was performed on FMC's former vegetation trial plots to provide an estimate of these parameters for use in performance modeling of the ET cover. Prior to laying out the sampling grid, test holes were excavated with a shovel to identify an area containing at least 18-inches of soil. Once identified, a 25 ft by 25 ft transect was measured. The transect was further divided into 5 ft by ft sampling grids. Three randomly placed hand-auger borings were advanced within each sampling grid and samples were collected at 6-inch increments (e.g. 0-6'', 6-12'', etc.). In general, top soil sampling was possible to a depth of 18-inches in the majority of soils with some locations only having top soil depth to 12-inches before contacting the underlying slag. The vegetation sampling grid is shown in Figure 2-3.

3.0 Laboratory Testing and Results

Following sample collection, the soil samples from the WUA, vegetation trial plot samples, and stormwater sewer piping were sent off for laboratory testing and analysis as described below.

3.1 WESTERN UNDEVELOPED AREA SOIL TESTING

3.1.1 Geotechnical Testing

Following collection of the disturbed (composite) and undisturbed samples, the samples were sent to IGES out of Salt Lake City for geotechnical and hydrological testing. The following tests were performed to further define the geotechnical properties of the soil:

Disturbed (composite) samples from test pits:

- Atterberg Limits (American Society of Test and Materials [ASTM] D4318) testing was conducted to evaluate the shrink-swell potential of the soil and its propensity to develop desiccation cracks during cyclical wetting and drying.
- Standard Proctor (ASTM D698) testing was conducted to further refine the maximum dry density (MDD) and optimum moisture content (OMC) of the soil to be used for specifying the percent compaction and in-place density of the soil.
- Particle size distribution testing (ASTM D422) was conducted to provide an indicator of material properties across the entire borrow area.
- Crumb and double hydrometer dispersion testing (ASTM D6572-12 and ASTM D4221-11) were conducted to evaluate the erosive potential of the soil due to dispersion.

Undisturbed samples from borings:

- In-situ density (ASTM D7263-09)
- In-situ moisture content (ASTM D2216-10)

The geotechnical tests and associated results performed on the grab samples collected from each test pit are summarized in Table 3.1. The laboratory report for the geotechnical tests are presented in Appendix D.

3.1.2 Hydrological Testing

The following tests were performed to determine the saturated and unsaturated hydrological properties of the borrow soil based on test pit samples and two boring samples (SB007 at 6' to 8' and 12' to 14' bgs):

- Saturated Hydraulic Conductivity (ASTM D5084)
- Water Characteristic Curve Testing (ASTM D6836)

The hydrological tests performed on the grab samples collected from each test pit and associated results are summarized in Table 3.2. The laboratory report for the root density measurements are presented in Appendix D.

Table 3.1 Summary of WUA Soil Geotechnical Testing and Associated Results

Soil Test	TP001	TP002	TP003	TP004	TP005	TP006	TP007	TP008	TP009	TP010	SB003	SB004	SB006	SB007	SB008
Standard Proctor Compaction Test (MDD lbs/ft ³) (ASTM ^a D698)	106.9	97.7	107	106.4	107.2	104.4	104.2	99.6	103.7	104.8	NA ^b	NA	NA	NA	NA
Optimum Moisture Content (OMC %) (ASTM D698)	17.5	22.7	16.6	16.2	15.9	16.8	17.7	19.4	16.9	16.8	NA	NA	NA	NA	NA
Particle Size Distribution (ASTM D422)											NA	NA	NA	NA	NA
% Gravel	0.0	0.0	0.3	0.0	0.0	0.0	0.0 – 0.1	0.0	0.6	0.1					
% Sand	3.4 – 4.8	1.6 – 9.4	4.1 – 4.8	2.9 – 4.5	3.3 – 3.7	4.0 – 4.4	12.4 – 15.4	4.1 – 11.4	3.7 – 5.5	6.5 – 7.4					
% Fines	95.2 – 96.6	90.6 – 98.4	95.0 – 95.6	95.5 – 97.1	96.3 – 96.7	95.6 – 96	84.6 – 87.6	88.6 – 95.9	94.0 – 95.8	92.5 – 93.4					
Atterberg Limits (ASTM D4318)															
LL ^c (%)	28	36	27	N.P. ^f	24	25	23	28	26	N.P.	NA	NA	NA	NA	NA
PL ^d (%)	21	22	21		22	21	22	22	21						
PI ^e (%)	7	14	6		2	4	1	6	5						
Crumb Test (D6572-12)	2 ^g	2	3	1	1	3	2	2	1	1	NA	NA	NA	NA	NA
Double Hydrometer Dispersion Test (D4221-11) (% Dispersion)	22.5	24.8	44.3	33.9	32.1	38.0	37.4	18.6	29.7	24.4	NA	NA	NA	NA	NA
In situ Density (lbs/ft ³) (ASTM D7263-09)	NA	NA	NA	NA	NA	NA	NA	NA	NA	90.8 (0' to 2')	77.5 (2' to 4')	80.2 (2' to 4')	70.4 (2' to 4')	79.3 (2' to 4')	
In-situ Moisture Content (%) (ASTM D2216-10)	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.9 (0' to 2')	4.8 (2' to 4')	15.1 (2' to 4')	15.5 (2' to 4')	8.4 (2' to 4')	
										6.0 (6' to 8')	9.4 (6' to 8')	5.9 (6' to 8')	3.3 (12' to 14')	8.6 (6' to 8')	

Notes:

^a ASTM American Society of Testing and Materials^b Not Analyzed^c LL: Liquid Limit^d PL Plastic Limit^e PI: Plasticity Index^f NP: Non-plastic

Table 3.2 Summary of WUA Soil Hydrological Testing and Associated Results

Test Pit/Boring I.D.	$K_{sat}^{b/}$ (cm/sec)	Van Genuchten Parameters ^{a/}			
		$\alpha^{c/}$ (cm ⁻¹)	N ^{d/} (dimensionless)	$\theta_r^{e/}$ (% vol)	$\theta_s^{f/}$ (% vol)
TP001	3.3E-05	1.0624	1.2659	0.0207	0.5257
TP004	1.4E-04	1.7409	0.2293	0.0431	0.4417
TP006	2.3E-05	0.5592	1.3116	0.0191	0.4776
TP007	5.8 E-05	0.8571	1.3562	0.0409	0.4865
TP008	7.87E-05	0.6665	1.4267	0.0543	0.5219
SB7 (6 to 8 feet bgs)	6.2E-05	NA ^{g/}	NA	NA	NA
SB7 (12 to 14 feet bgs)	3.1E-04	NA ^{g/}	NA	NA	NA

Notes:^{a/} Van Genuchten Parameters for SWCC testing (ASTM 6836)^{b/} K_{sat} = saturated hydraulic conductivity (ASTM D5084)^{c/} α = inverse of the air-entry value (or bubbling pressure)^{d/} n = pore size distribution index [dimensionless]^{e/} θ_r = residual water content^{f/} θ_s = saturated water content^{g/} NA = not analyzed

3.1.3 Agronomic Testing

Three (3) composite samples (CP01, CP02 and CP03), derived from the ten (10) test pits were sent off for agronomic testing. The agronomic testing was performed by ACZ Laboratories. The agronomic test performed and associated results are presented in Table 3.3. As indicated by Table 3.3, the results were consistent for the three samples. The laboratory reports for the agronomic testing are presented in Appendix E.

Table 3.3 Summary of WUA Soil Agronomic Testing and Associated Results

Analyses	Sample I.D.		
	WUA-CP01	WUA-CP02	WUA-CP03
Cation Exchange Capacity (meq/100g)	8.50	11.0	10.0
Phosphorus, total (mg/Kg)	790	780	790
Potassium, total (mg/Kg)	2410	2780	2620
Carbon, total organic (%)	0.2	0.2	0.2
Conductivity @25°C (mmhos/cm)	0.442	0.594	0.456
Organic Matter (%)	0.8	0.9	0.9
pH, Saturated Paste	8.6	8.4	8.5
Solids (%)	94.1	91.9	93.0
Nitrogen, ammonia (mg/Kg)	10.6	11.1	10.7

3.2 ROOT DENSITY TESTING

Root density testing was performed using the procedures described in the Work Plan. The results of the root density testing are summarized in Table 3.4. The laboratory report for the root density measurements are presented in Appendix F.

Table 3.4 Root Density Measurements

Sample	Grams of Roots per 100 grams of Soil
Grid #6—Location #1	
0-6 inches	0.019
6-12 inches	0.078
12-18 inches	0.003
Grid #6—Location #2	
0-6 inches	0.084

Sample	Grams of Roots per 100 grams of Soil
6-12 inches	0.019
12-18 inches	0.014
Grid #6—Location #3	
0-6 inches	0.032
6-12 inches	0.013
12-18 inches	0.005
Grid #7—Location #1	
0-6 inches	0.039
6-12 inches	0.020
12-18 inches	0.013
Grid #7—Location #2	
0-6 inches	0.036
6-12 inches	0.029
12-18 inches	0.021
Grid #7—Location #3	
0-6 inches	0.089
6-12 inches	0.024
12-18 inches	0.015
Grid #8—Location #1	
0-6 inches	0.102
6-12 inches	No sample
12-18 inches	0.020
18-24 inches	0.006
Grid #8—Location #2	
0-6 inches	0.076
6-12 inches	0.075
12-18 inches	0.013
18-24 inches	0.004
Grid #8—Location #3	
0-6 inches	0.048
6-12 inches	0.028
12-18 inches	0.013
Grid #13—Location #1	
0-6 inches	0.104
6-12 inches	0.036
12-18 inches	No sample
Grid #13—Location #2	
0-6 inches	0.064
6-12 inches	0.032
12-18 inches	No sample
Grid #13—Location #3	
0-6 inches	0.101
6-12 inches	0.034
12-18 inches	0.014
Grid #14—Location #1	
0-6 inches	0.087
6-12 inches	0.054
12-18 inches	0.016
Grid #14—Location #2	
0-6 inches	0.109
6-12 inches	0.051
12-18 inches	0.026
Grid #14—Location #3	
0-6 inches	0.053
6-12 inches	0.040
12-18 inches	0.019

Sample	Grams of Roots per 100 grams of Soil
Grid #15—Location #1	
0-6 inches	0.054
6-12 inches	0.018
12-18 inches	0.011
Grid #15—Location #2	
0-6 inches	0.077
6-12 inches	0.038
12-18 inches	0.008
Grid #15—Location #3	
0-6 inches	0.060
6-12 inches	0.023
12-18 inches	0.013
Grid #16—Location #1	
0-6 inches	0.069
6-12 inches	0.051
12-18 inches	0.016
Grid #16—Location #2	
0-6 inches	0.118
6-12 inches	0.044
12-18 inches	0.023

As indicated in Table 3.4, 3 discrete interval samples were not analyzed. The two Grid # 13 samples collected at an interval of 12- 18-inches were not sent to the lab due to the presence of shallow slag, which precluded obtaining a hand-auger sample. The sample associated with Grid #18 at the 6 to 12 inch interval was not analyzed because it was compromised during shipping.

4.0 Data Gap Findings and Conclusions

This section presents recommendations for the design parameters to be used in the Remedial Design (RD). ProUCL 5.0 Statistical Software was used to calculate the means for the design parameters shown in the table below. The results of the ProUCL analysis are presented in Appendix H. As shown in Appendix H, the data for the geotechnical and hydrological parameters were generally normally distributed and hence the use of mean values for these parameters in the remedial design is appropriate.

4.1 GEOTECHNICAL RECOMMENDATIONS

The main purpose of the geotechnical testing was to define appropriate design parameters of the WUA borrow soil for use in ET soil cover modeling, to estimate volume of soil required from the WUA, and evaluate the WUA soils susceptibility to erosion and desiccation cracking. The proposed geotechnical design parameters for the WUA borrow soil are summarized Table 4.1.

Table 4.1 Recommended Geotechnical Design Parameters for WUA Borrow Soil

Parameter	Value
MDD (lbs/ft ³) per ASTM D698	104.2 (mean)
OMC (%) per ASTM D698	17.1 (mean)
In situ Density (lbs/ft ³) per ASTM D7263-09	81.1 (mean)
In-situ Moisture Content (%) per ASTM D2216-10	8.7 (mean)

4.2 HYDROLOGICAL RECOMMENDATIONS

The main purpose of the hydrological testing was to define appropriate design parameters of the WUA borrow soil for use in the modeling of the ET soil cover. The proposed hydrological design parameters for the WUA borrow soil are summarized Table 4.2.

Table 4.2 Recommended Hydrological Design Parameters for WUA Borrow Soil

Parameter	Value
Hydraulic Conductivity (cm/sec) per ASTM 5084	6.57E-5 (mean)
Van Genuchten Parameters (per ASTM 6836)	
α (cm)	0.97722 (mean)
n (dimensionless)	1.11794 (mean)
θ_r (%vol)	0.03562 (mean)
θ_s (%vol)	0.49068 (mean)

4.3 ROOT DENSITY RECOMMENDATIONS

The main purpose of the root density testing was to provide a quantification of the vegetation quality that can be established for use in the ET soil cover modeling. Based on the ProUCL analysis presented in Appendix H, a mean was selected resulting in a design root density value of 0.051 grams of roots per 100 grams of soil.

4.4 STORMWATER SEWER VIDEO SURVEY FINDINGS

A summary of the stormwater sewer piping video survey is provided in Table 4.3 presenting the total volume of solids expected to be removed, characterized, and disposed as result of the RA-A stormwater sewer pipe cleaning. While the video survey did not identify any P4 present in the stormwater sewer piping, all precautions will be taken during cleaning of the piping in the event P4 is encountered. Also, while the waste determination performed on the decon water and sediments collected during the video survey indicated that the water and sediments were non-hazardous, wastes generated during the cleaning of the stormwater sewer piping will be fully characterized.

4.5 BORROW SOURCE AVAILABILITY

In addition to collecting disturbed and undisturbed soil samples, the WUA soil investigation was also used to characterize the approximate quantity of borrow soil available for use during the remedial action. The depth information obtained from the soil boring and test pit were used to develop an isocontour map of the depth of silt throughout the WUA and is presented in Figure 4-1. Based on Figure 4-1, there is approximately 2.4 million CY of soil (silt) available for use in the ET and Gamma soil covers. The preliminary required soil volume based on a 12-inch gamma cap and 30-inch ET cover is approximately 1.3 million CY. Therefore, there is ample soil available in the WUA to support the RA.

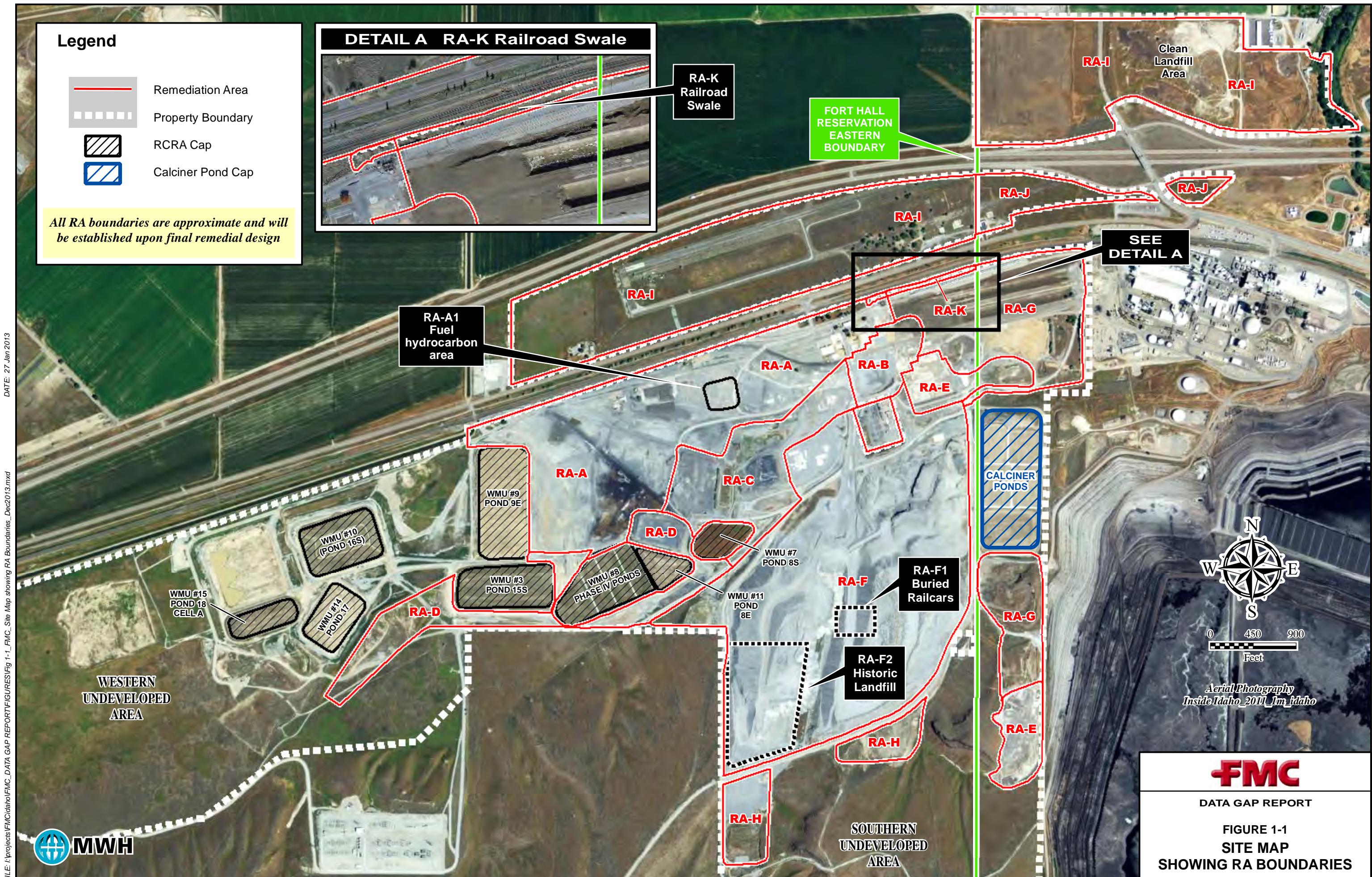
Table 4.3 Summary of Stormwater Sewer Piping Video Survey

Piping Segment	Total Segment Length (ft)	Pipe Construction	Pipe OD/ID (in)	Total Segment Volume (ft ³)	Percent Full of Sediment %	Maximum Sediment Volume to be Removed per Segment (ft ³)	Evidence of P4?
West Discharge to Area Inlet #1	129	concrete	16/11.5	93	70	65	No
East Discharge to Area Inlet #1	85	concrete	16/11.5	61	10	6	No
Area Inlet #4 to Area Inlet #3	107	concrete	16/11.5	77	100	77	No
Area Inlet #4 to Area Inlet #2	170	steel	8/7.98	60	70	42	No
Area Inlet #5 to pipe junction	180	steel	8/7.98	62	70	43	No
Manhole #1 to Area Inlet #3	169	concrete	16/11.5	122	50	61	No
Total Maximum Sediment to be Removed						294	

5.0 REFERENCES

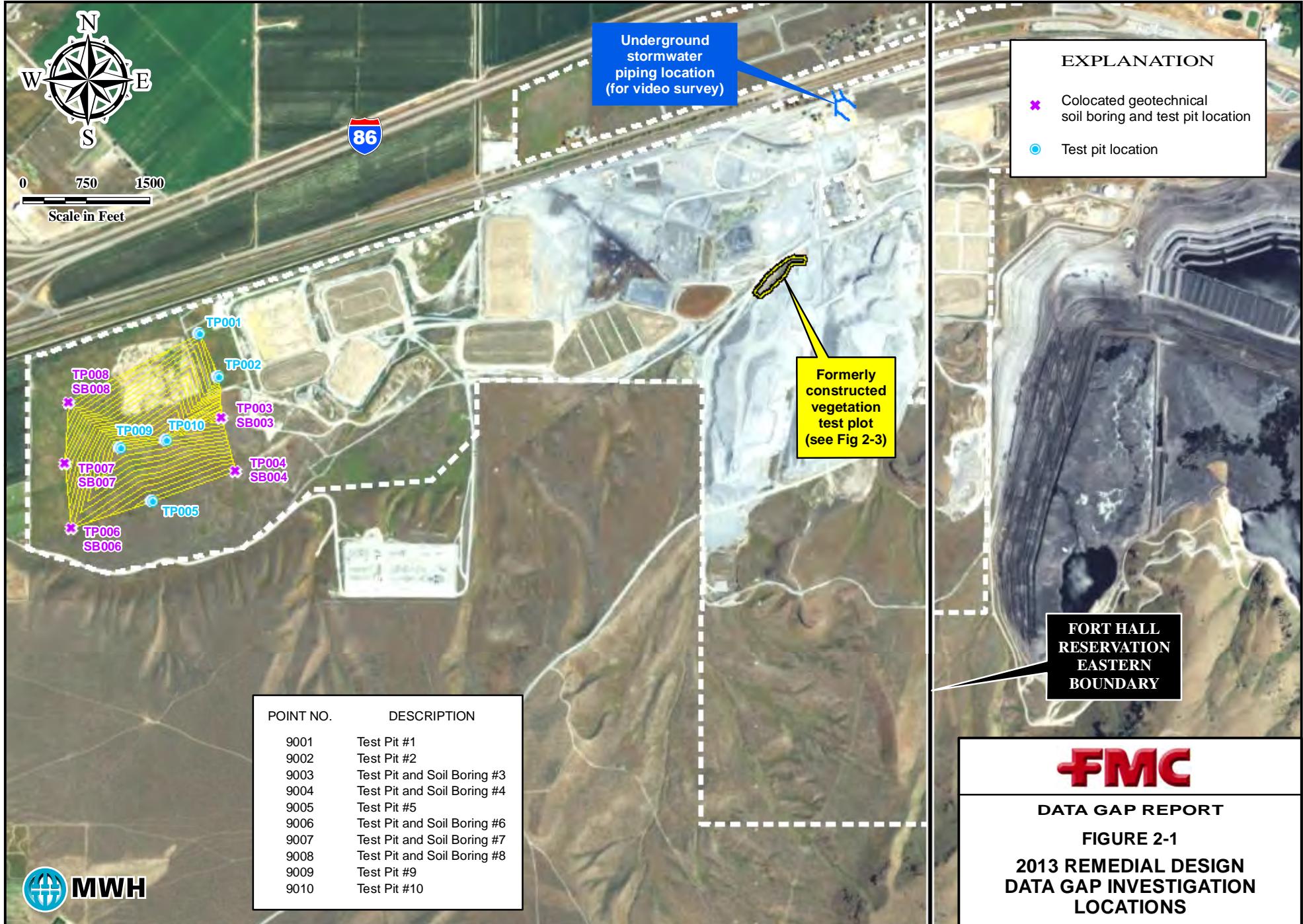
- EPA, 2012. Interim Amendment to the Record of Decision for the EMF Superfund Site - FMC Operable Unit - Pocatello, Idaho (IRODA), September 27, 2012.
- EPA, 2013. Unilateral Administrative Order for Remedial Design and Remedial Action, EPA Docket No. CERCLA-10-2013-0116 (UAO for RDRA), June 10, 2013.
- MWH, 2010. Supplemental Feasibility Study Report for the FMC Plant OU, MWH Americas, Inc., March 2010.
- MWH, 2013a. Remedial Design Work Plan, MWH Americas, Inc., August 2013.
- MWH, 2013b. Remedial Design Data Gap Work Plan, MWH Americas, Inc., July 2013.

Figures



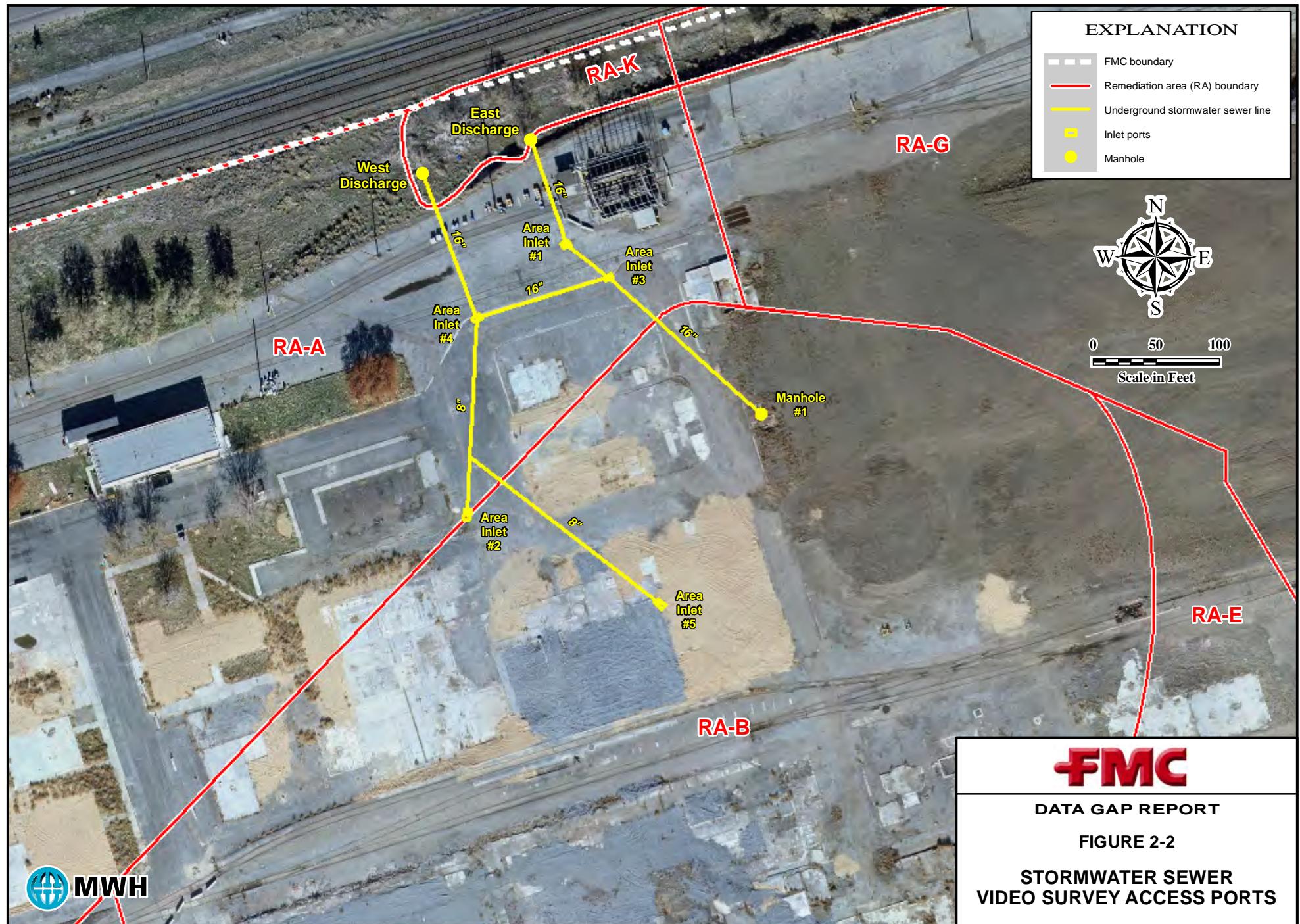
FILE: I:\projects\FMCidaho\FMC_DATA GAP REPORT\FIGURES\Fig 2-1_2013 RD Data Gap Invest Locs.mxd

DATE: 27 Jan 2014



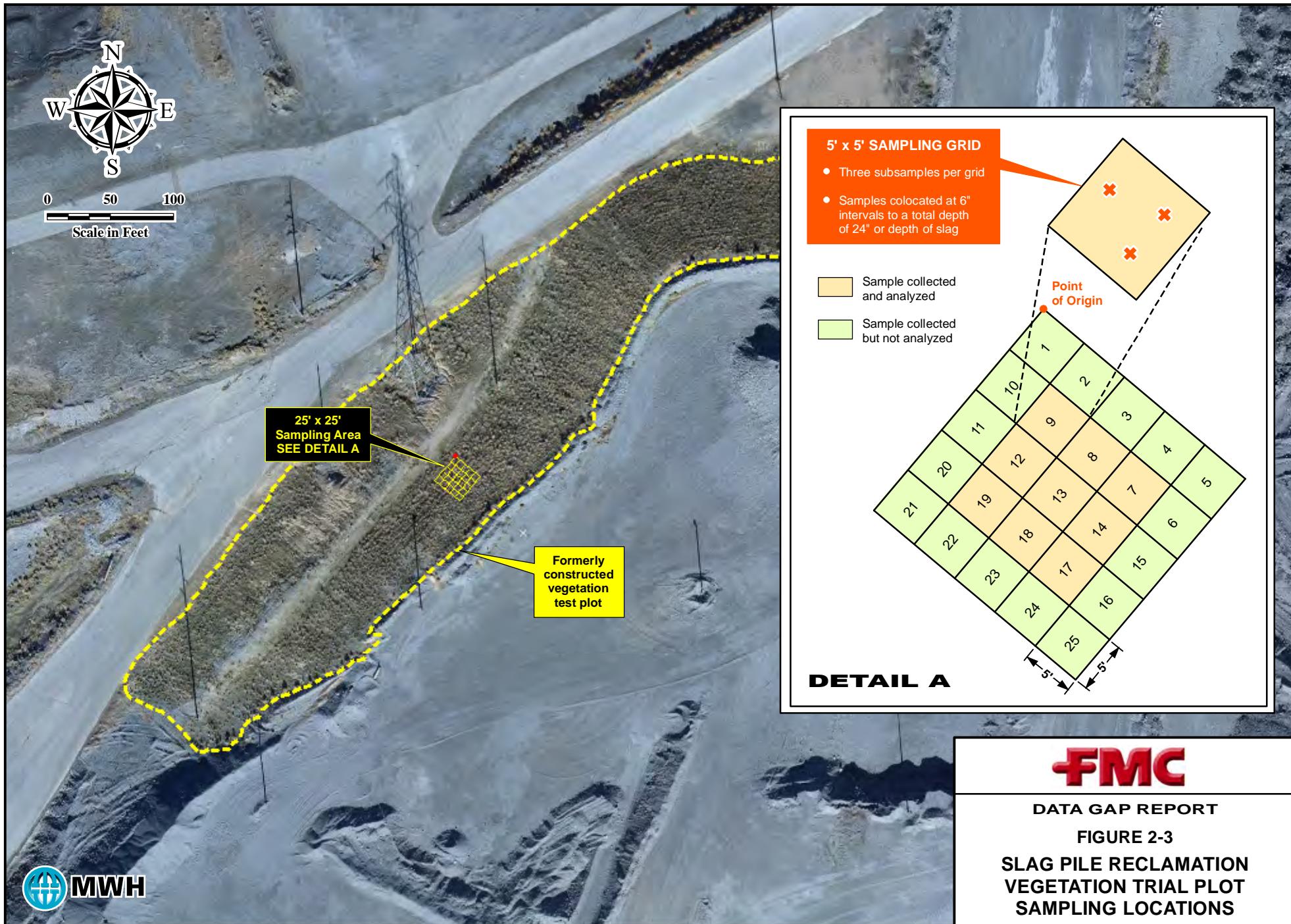
FILE: I:\projects\FMCidaho\FMC_DATA GAP REPORT\FIGURES\Fig 2-2_Stormwater Video Survey_Jan2014.mxd

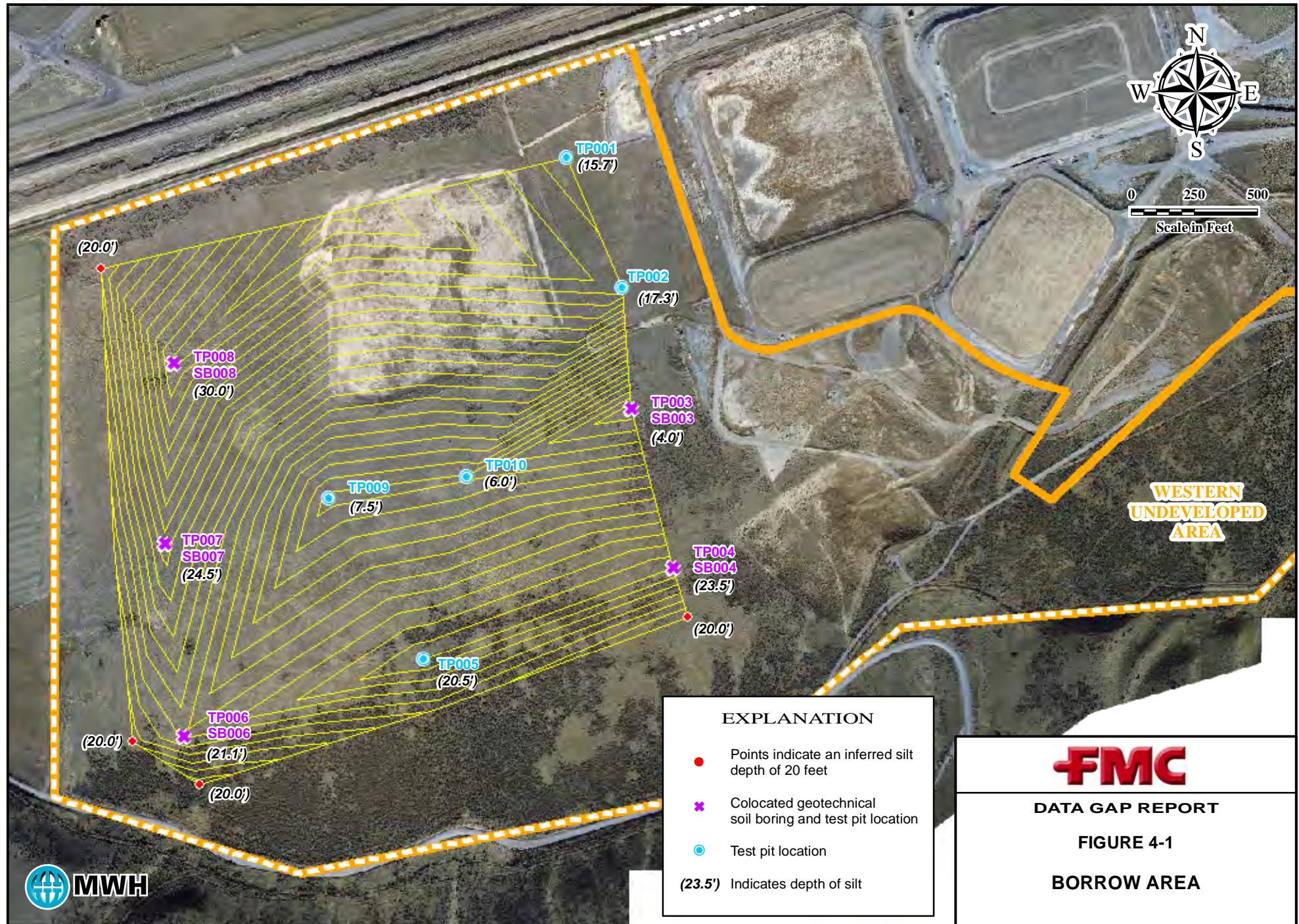
DATE: 23 Dec 2013



FILE: I:\projects\FMCidaho\FMC_DATA GAP REPORT\FIGURES\Fig 2-3_Slag Pile Reclamation Veg Trial Plot.mxd

DATE: 27 Jan 2014





APPENDIX A

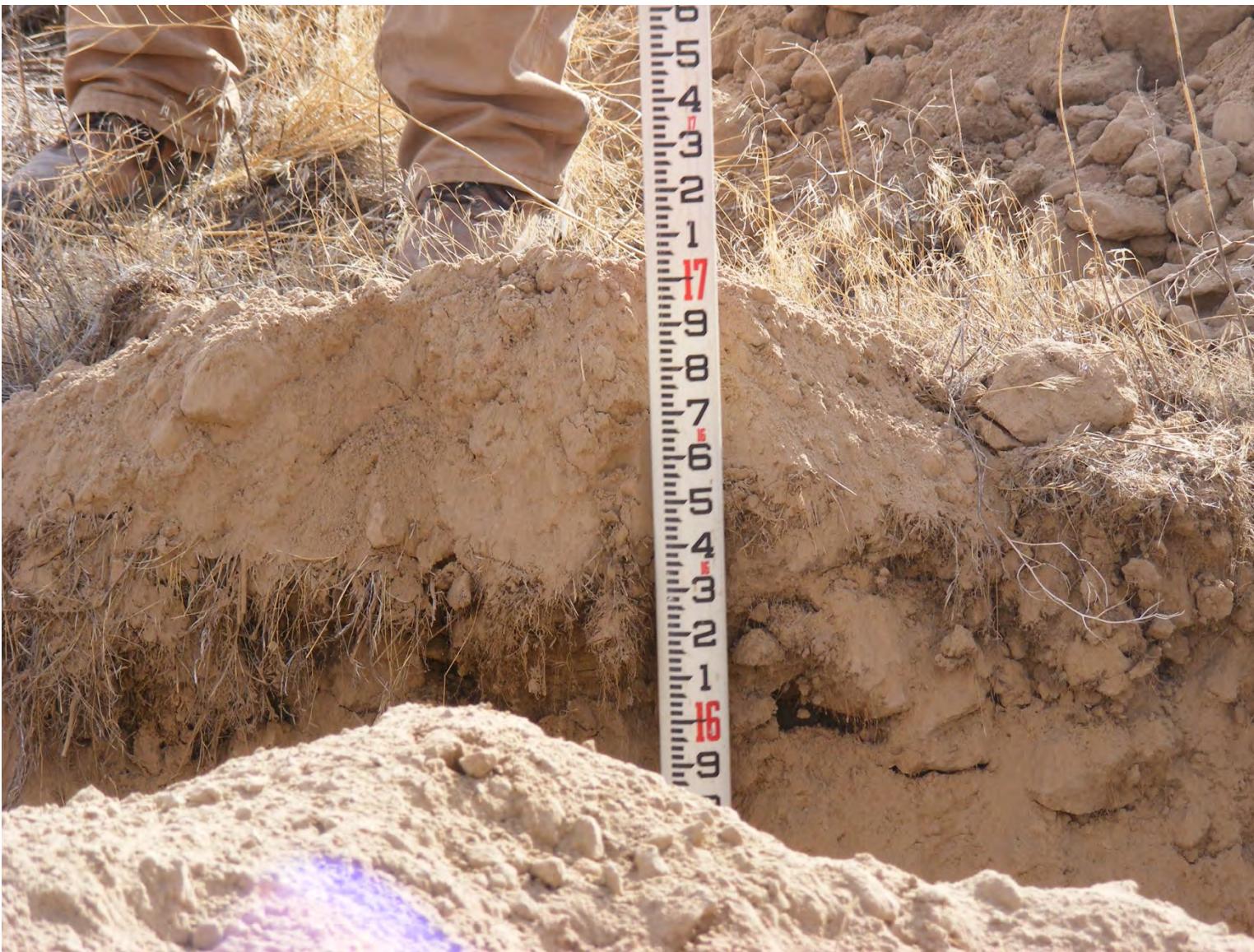
Field Investigation Photographs



Photograph 1 (taken 10/29/2013) – Looking at base of excavation in TP001.



Photograph 2 (taken 10/29/2013) – Looking at shallow gravels contacted in TP003 .



Photograph 3 (taken 10/29/2013) – Looking at depth measurement taken at the base of TP004.



Photograph 4 (taken 10/30/2103) – Looking at base of excavation in TP005.



Photograph 5 (taken 10/30/2013) – 6-inch minus gravels excavated from TP009 encountered at 7.5 feet bgs.



Photograph 6 (taken 11/12/2013) – Core taken from SB004 showing silt borrow material collected from 20 to 21.5 feet bgs.



Photograph 7 (taken 11/12/2013) – Core taken from SB004 showing gravels collected from 25 to 26.5 feet bgs.



Photograph 8 (taken 11/13/2013) – Looking southwest at hollow-stem auger drill rig at SB008.



Photograph 9 (taken 11/06/2013) – Looking south at video survey equipment in 16-inch reinforced concrete pipe in entrance to East Discharge.



Photograph 10 (taken 11/06/2013) – Video survey equipment lowered into manhole.



Photograph 11 (taken 11/06/2013) – Video survey control room.



Photograph 12 (taken 11/06/2013) – Decontamination of video survey equipment.

APPENDIX B

Test Pit Logs



TRENCH TEST PIT LOG FORM

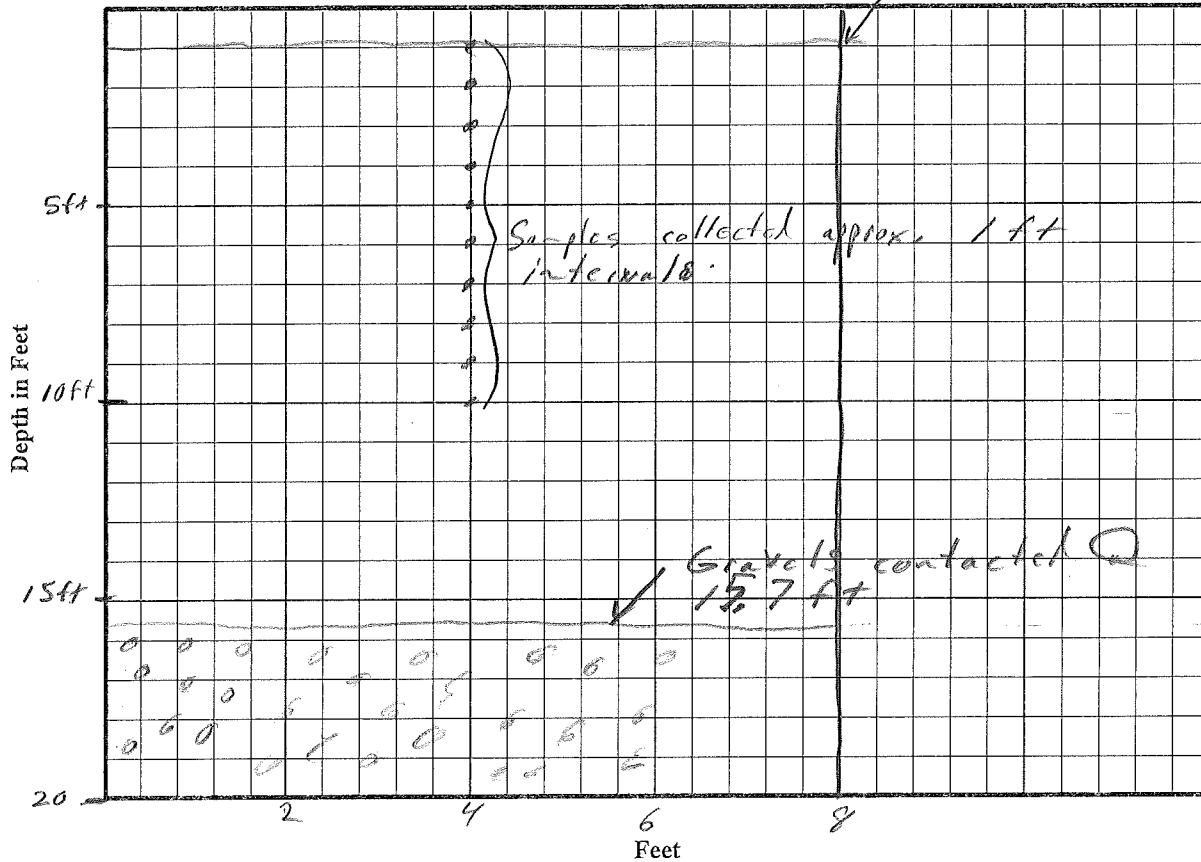
Page 1 of 1

Project FMC Data Gap Investigation
 Sample Location WVA
 Coordinates: Inside Stake N 44° 28' 20.8" E
Outside Stake E 548 752.9 S
Elevation Native/Fill Stake 4441 ft amsl
 Logged By Chad Tomlinson

Project Number 10503311Trench Number TP001Date 10/29/2013East EndOutside Stake548 752.9 SNative/Fill Stake4441 ft amslChad Tomlinson

TRENCH PROFILE

~12" Topsail (not sampled)



Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

12" Top soil with extensive roots

14.7' of silt (ML), (Brown), (Low plasticity), moderate density,
dry

15.7" gravel contacted, Gravel appears to be quartzitic
in nature. Mainly 4" minus.

Begin Trench 9:50Finish Trench 10:25Trenching Contractor KWTotal Depth 15.7 ftTotal Length 8 ft

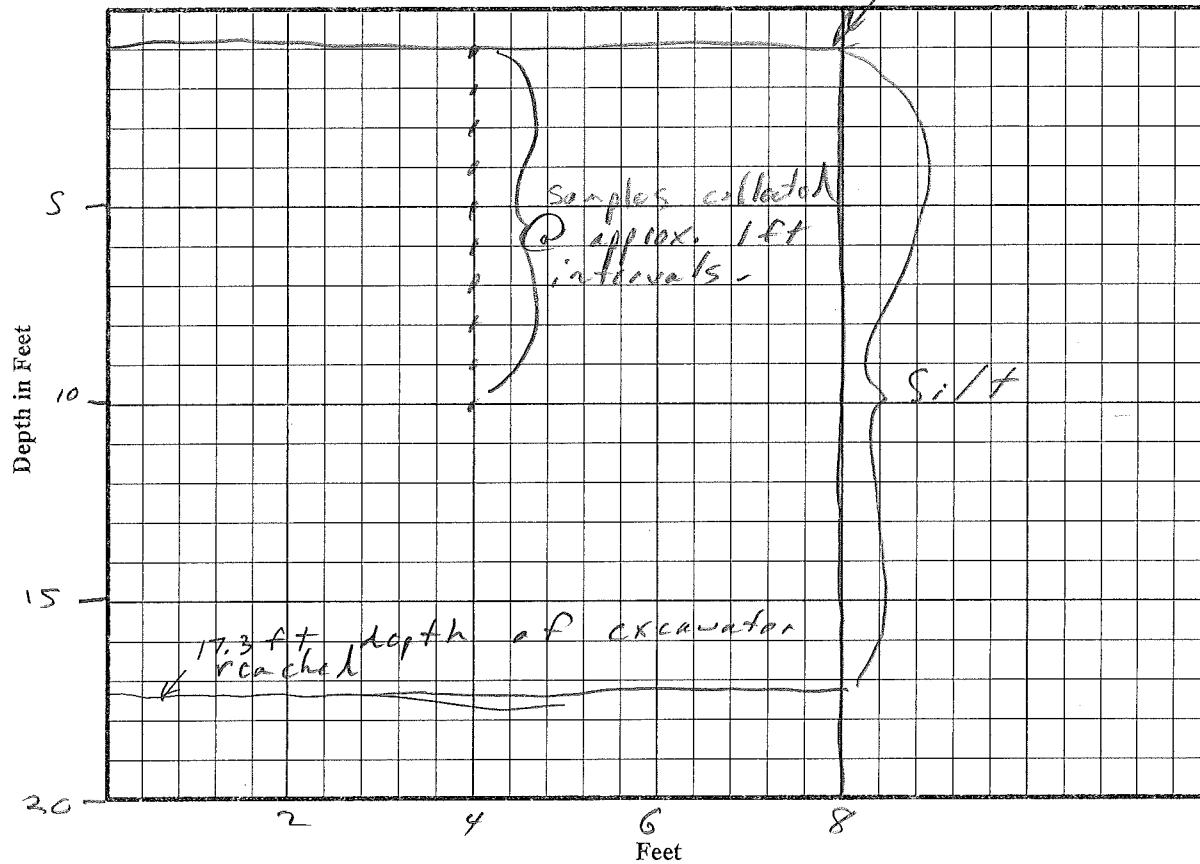
MWH

FMC

TRENCH TEST PIT LOG FORM

Page 1 of 1Project FMC Data Gap InvestigationProject Number 10503311Sample Location WVATrench Number TP002Coordinates: Northing 449308.2Easting 548972.9Elevation 4441.8Date 10/29/2013Native/Fill Stake 4441.8Logged By Chad Tomlinson12" of Topsoil

TRENCH PROFILE



Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

Excavated to total depth of 17.3 ft. Native
silt encountered as in TP001.Begin Trench 10:36Finish Trench 11:13Trenching Contractor KwTotal Depth 17.3Total Length 8

MWH

FMC

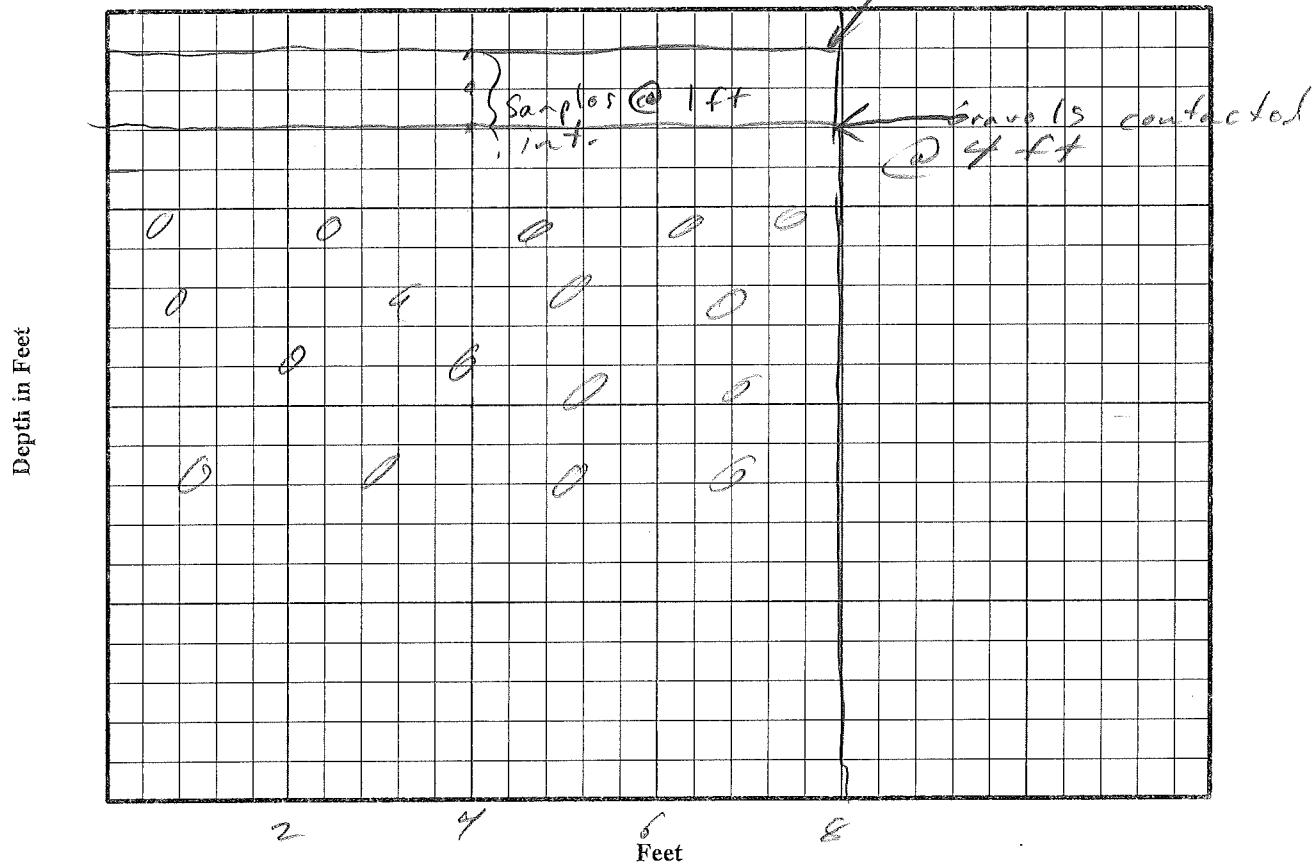
TRENCH TEST PIT LOG FORM

Page 1 of 1

Project FMC Data Gap Investigation Project Number 10513311
 Sample Location WVIA Trench Number TP003
 Coordinates: Inside State 448827.0 Outside State 549003.4
Native/Fill Stake
 Logged By Chad Tomlinson

Date 10/29/2013

TRENCH PROFILE



Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

12" of top soil with extensive root structure3'-of silt (Refer to TP001 for description of silt)Gravel contacted @ 4ft

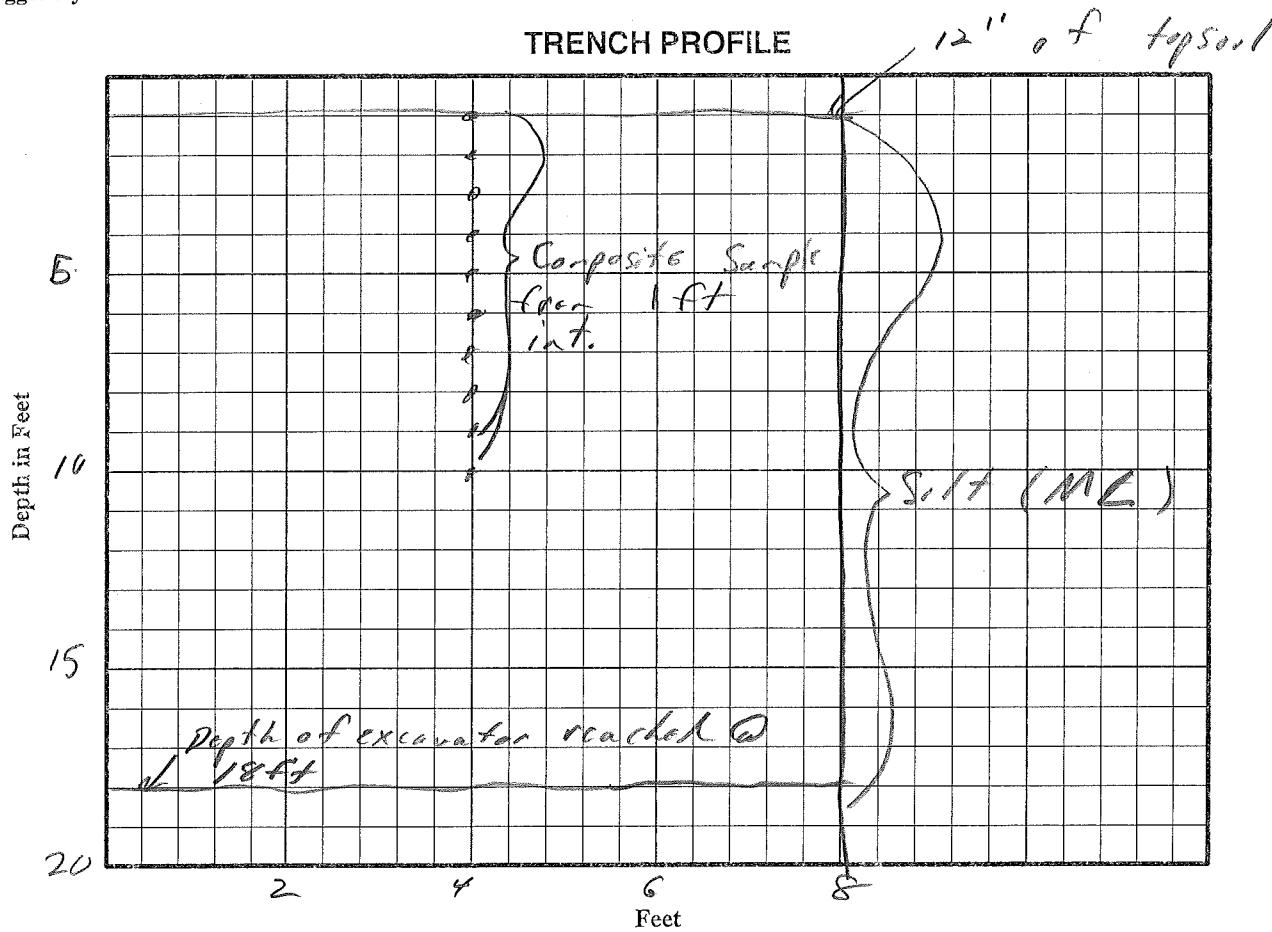
Begin Trench 11:23 Finish Trench 11:30 Trenching Contractor KW
 Total Depth 4 ft Total Length 8



TRENCH TEST PIT LOG FORM

Page 1 of 1Project FMC Data Gap Investigation Project Number 10503311Sample Location WUATrench Number TP002Date 10/29/2013Coordinates: Inside Stake 448196.6Outside Stake 549171.6Elevation Native/Fill Stake 4453.5Logged By Chad Tantilson

TRENCH PROFILE



Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

Refer to TP001 for description of silt

Begin Trench 13:25Finish Trench 13:55Trenching Contractor KWTotal Depth 18Total Length 8**MWH**

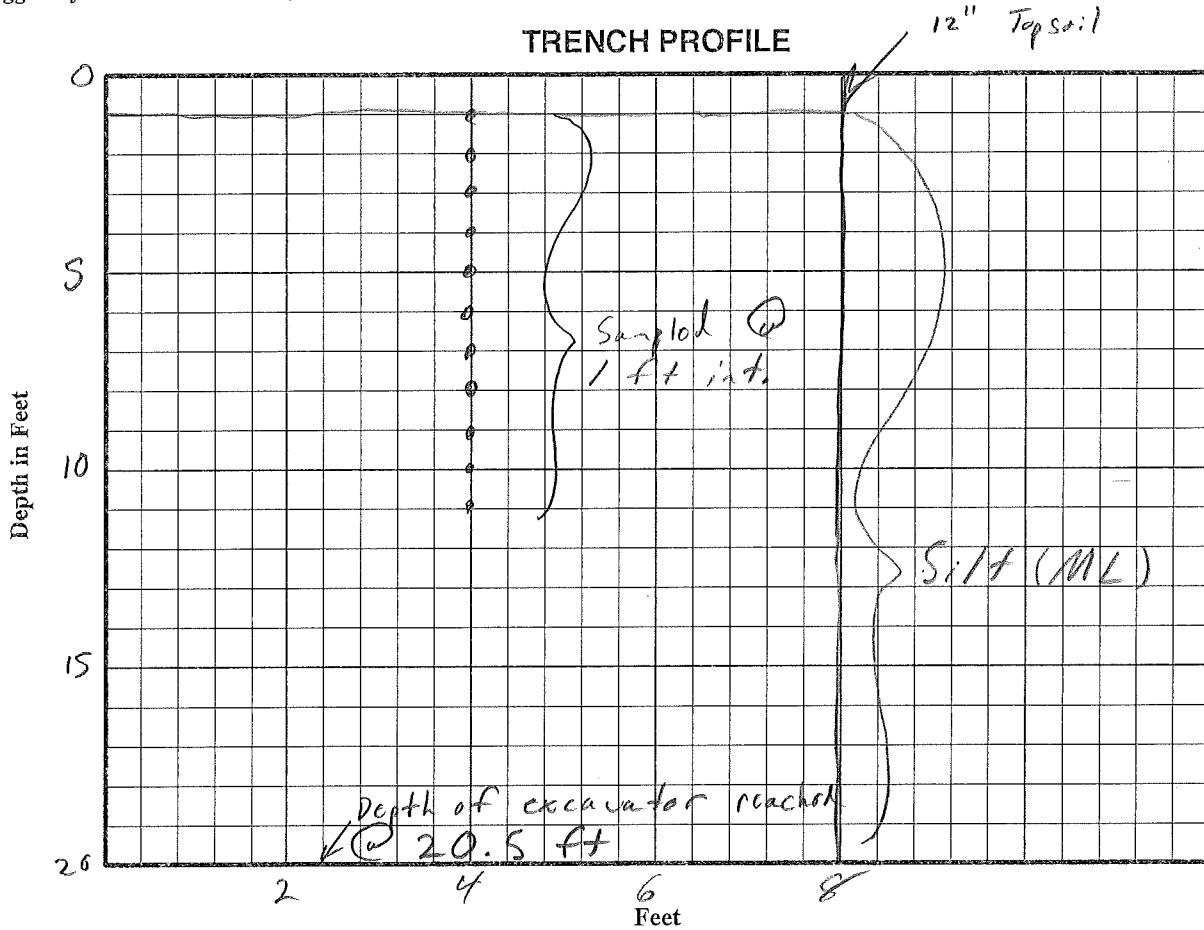
FMC

TRENCH TEST PIT LOG FORM

Page 1 of 1

Project FMC Data Gap Investigation Project Number 10503311
 Sample Location WVA Trench Number TP005 Date 10/29/2013
 Coordinates: Inside Stake 4478 35.6 Outside Stake 54818 7.9
Existing Native/Fill Stake 4450.5
 Logged By Chad Tomlinson

TRENCH PROFILE



Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

Refer to TP001 for description of silt

Begin Trench 14:05 Finish Trench 14:37 Trenching Contractor KW
 Total Depth 20.5 ft Total Length 8



MWH

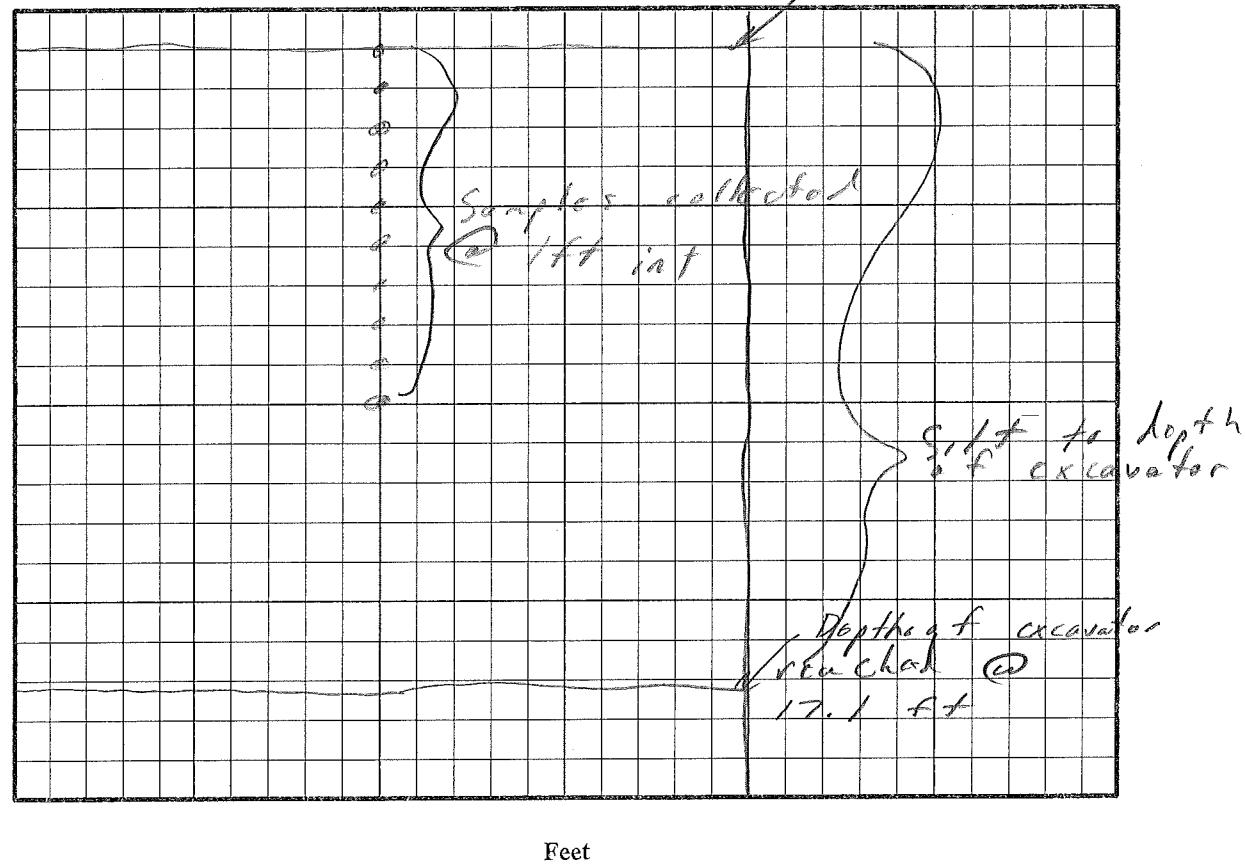


TRENCH TEST PIT LOG FORM

Page 1 of 1

Project FMC Data Gap Investigation Project Number 10503311
 Sample Location WVA Trench Number TP006 Date 10/29/2013
 Coordinates: Inside Stake 447529.7 Outside Stake 547237.3
 Elevation Native/Fill Stake 4454.9
 Logged By Chad Tomlinson

TRENCH PROFILE



Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

Refer to TP001 for description of soil

Begin Trench 14:45 Finish Trench 15:11 Trenching Contractor KW
 Total Depth 17.1 ft Total Length ~ 8 ft

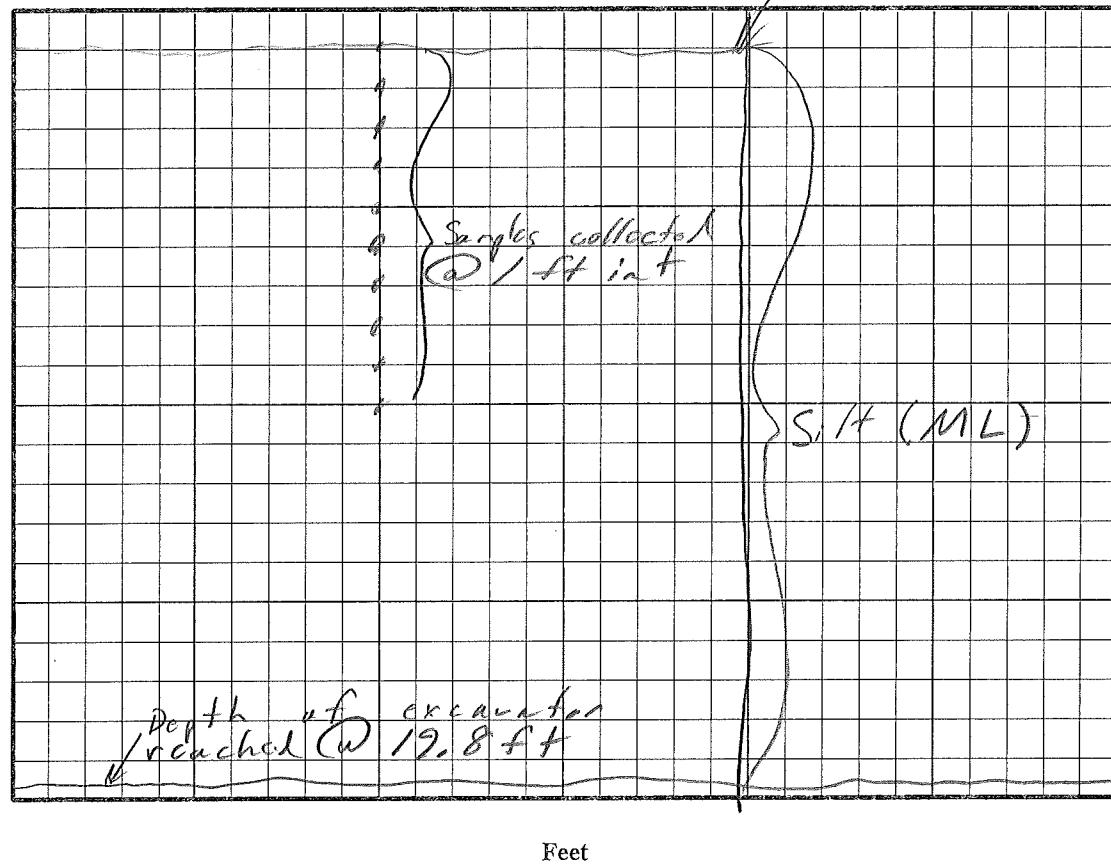
FMC

TRENCH TEST PIT LOG FORM

Page 1 of 1Project FMC Data Gap InvestProject Number 10503311Sample Location WVATrench Number TP007Coordinates: Inside Stake N48295.4Outside Stake S47160.5BlocNative Fill Stake 4452.9EastLogged By Chad TimlinsonDate 10/30/13

TRENCH PROFILE

Depth in Feet



Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

Refer to TP001 for soil descriptionBegin Trench 10:20Finish Trench 10:48Trenching Contractor KWTotal Depth 19' 2"Total Length 8

MWH



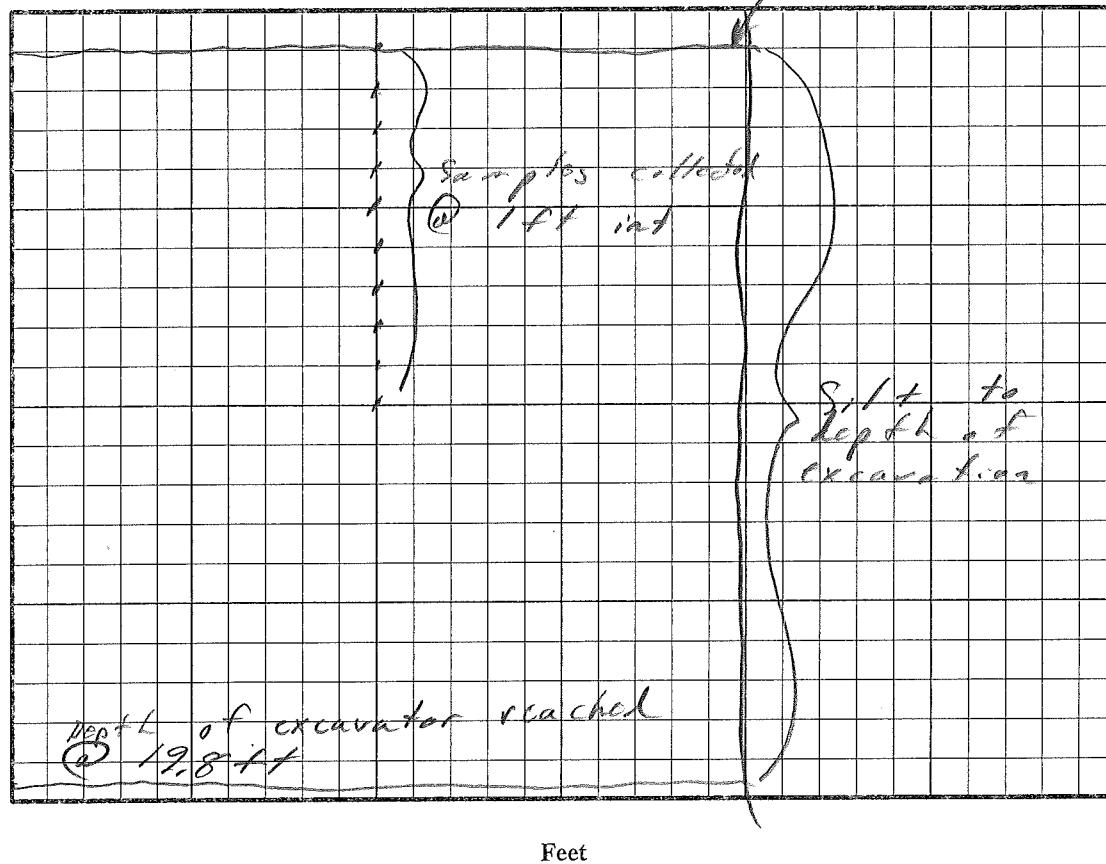
TRENCH TEST PIT LOG FORM

Page _____ of _____

Project FMC Pata Gap InvestProject Number 10503311Sample Location WVATrench Number TP008Date 10/30/13Coordinates: Inside Stake 442010.0Outside Stake 547194.5Elev Native/Fill Stake 4451.7Logged By Chad Tomlinson

TRENCH PROFILE

Depth in Feet



Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

Refer to TP001 for soil description

Begin Trench 11:00
Total Depth 19.8"

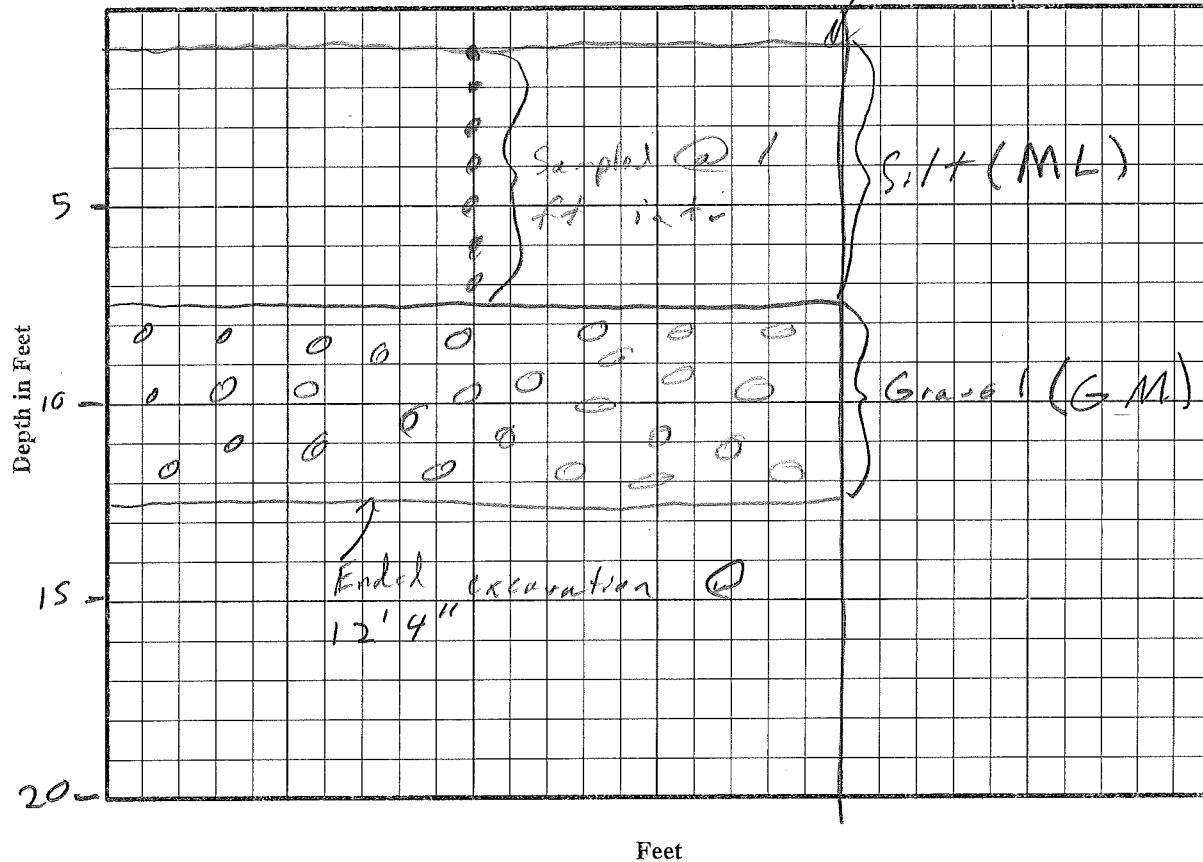
Finish Trench 11:33
Total Length 8

Trenching Contractor KW**MWH**

TRENCH TEST PIT LOG FORM

Page 1 of 1Project FMC Data Gap Invest.Project Number 10503311Sample Location WULTrench Number T009Date 10/30/13Coordinates: Inside Stake 448471.8Outside Stake 547809.6Elev Native/Till Stake 444800Logged By Chad Tomlinson

TRENCH PROFILE

12' Topsoil

Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

Refer to TP001 for soil descriptionsBegin Trench 11:49Finish Trench 12:07Trenching Contractor KWTotal Depth 12' 4"Total Length 8

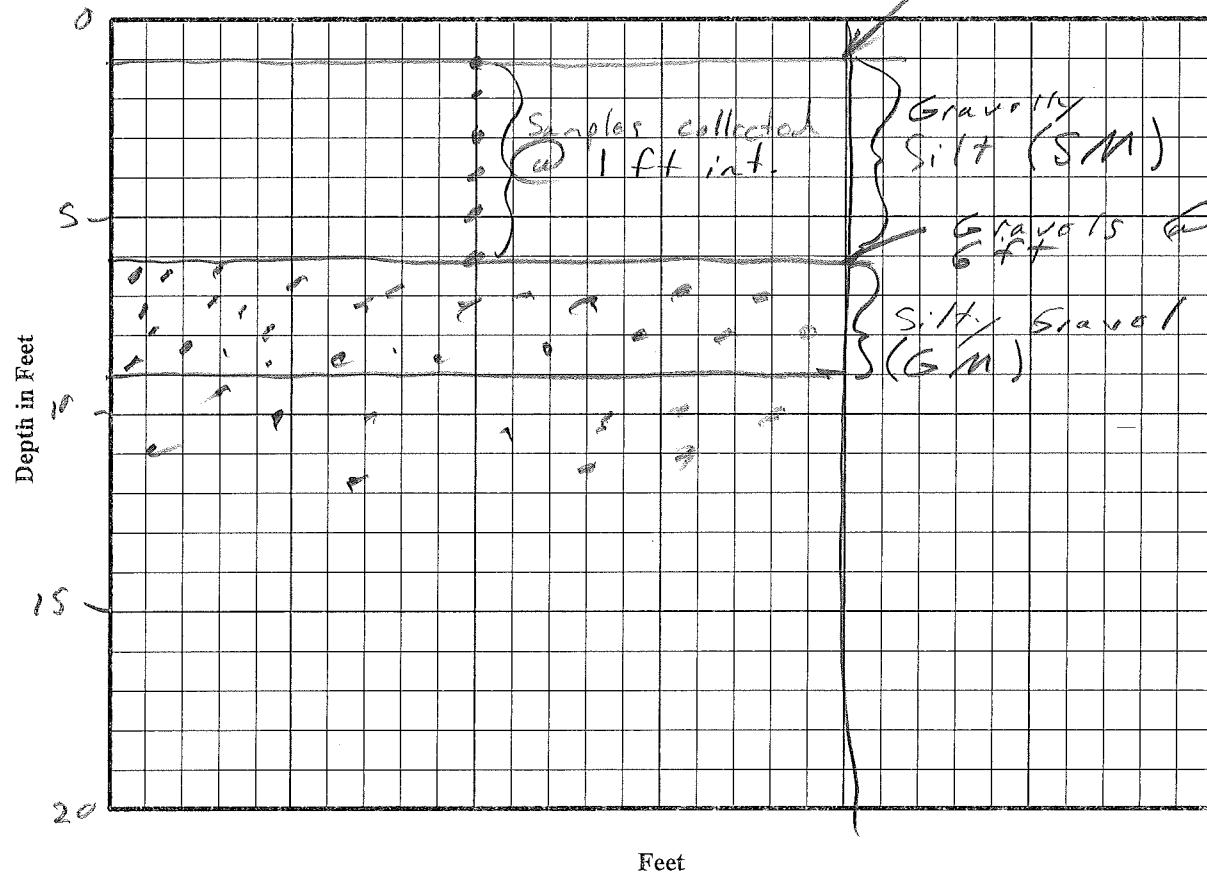
MWH



TRENCH TEST PIT LOG FORM

Page 1 of 1Project FMC Data Gap InvestSample Location WVACoordinates: Inside Stake 448557.3Elev Native/Ell Stake 4446.2Logged By Chad TomlinsonProject Number 10503311Trench Number TP010Date 10/30/13Outside Stake 348356.9

TRENCH PROFILE



Subsurface description and field USCS Classifications

(USCS name, color, size and angularity or plasticity, density, moisture content, additional facts and debris encountered)

Gravels (GM) encountered @ 6 ft excavated down to 9 ft and still in gravels. Excavated additional exploratory borings N + S of TP010. Appears that shallow gravels extend approx 300 ft N + S of TP010

Begin Trench 12:25 Finish Trench 13:00 Trenching Contractor KW

Total Depth 9 Total Length 8

**MWH**

FMC

DAILY QUALITY CONTROL REPORT

PROJECT FMC Data Gap Investigation
 JOB NO. 1050331
 LOCATION WVA
 CONTRACT NO. _____

DATE 10/29/13

DAY	S	M	T	W	TH	F	S
-----	---	---	---	---	----	---	---

WEATHER	Bright Sun	Clear	Overcast	Rain	Snow
	To 32	32-50°	50-70	75-85	85 up
TEMP	Still	Moder.	High	Report No.	
	Dry	Moder.	Humid		
HUMIDITY				DGFI-1	

PERSONNEL AND SUBCONTRACTORS ON SITE:

KW: Mark Smith, Rick
 MWI: Chad Tontison , Tribe: Kelly Wright
 BoozE

VISITORS ON SITE:

EQUIPMENT ON SITE: Trackhoe, front end loader, shovels, buckets

WORK PERFORMED (INCLUDING SAMPLING):

Excavated TP001, TP002, TP003, TP004, TP005 and TP006. Collected samples from every 1 ft interval down to approximately 10 ft. Filled 2 5-gallon buckets at each test pit. Continued excavation below 10 ft until underlying gravels reached or depth of excavator met. Gravels contacted in 2 test pits: 1) TP001 @ 15.7 ft and 2) TP003 @ 4 ft. TP002, TP004, TP005, and TP006 excavated to total depth of excavator generally around 17.5 to 20 ft bgs. #P





(Continuation Sheet)

PROJECT FMC Data Gap Field InvestigationREPORT NO. P6FJ-1JOB NO. 105 03311DATE 10/29/13

QUALITY CONTROL ACTIVITIES (INCLUDING FIELD CALIBRATIONS):

No field measurements completed

HEALTH AND SAFETY LEVELS AND ACTIVITIES:

Level D (modified)

PROBLEMS ENCOUNTERED/CORRECTIVE ACTION TAKEN:

SPECIAL NOTES:

TOMORROWS EXPECTATIONS:

Complete remaining test pitsDISTRIBUTION : 1. MW PROJECT MANAGER
2. PROJECT FILEPage 2 of 2SUBMITTED BY Chad Tomlinson TITLE Project Engineer

FMC

DATE 10/30/13

DAILY QUALITY CONTROL REPORT

PROJECT FMC Data Gap Investigation
 JOB NO. D 105 03311
 LOCATION WVA
 CONTRACT NO. _____

DAY	S	M	T	W	TH	F	S
WEATHER	Bright Sun	Clear	Overcast		Rain		Snow
TEMP	To 32	32-50	60-70		75-85	85 up	
WIND	Still	Moder.	High				Report No.
HUMIDITY	Dry	Moder.	Humid				D6FI-2

PERSONNEL AND SUBCONTRACTORS ON SITE:

KW: Mark Smith, RickMWH: Chad Tolinson

VISITORS ON SITE:

EQUIPMENT ON SITE: Trackhoe, front-end loader, shovels, buckets

WORK PERFORMED (INCLUDING SAMPLING):

Excavated TP007 - TP010, TP008 and TP010were only test pits that contacted gravels,TP008 gravels @ 7.5 ftTP010 gravels @ 6 ft

Performed additional test pits to define N-S extent of gravels @ TP000. Appears that gravels extend approximately 300 ft N and S of TP010 and in line with TP003 and TP009. Excavated additional test pit in southwest corner of existing borrow source. Excavated down to 20 ft below existing grade (10' below natural) w/o hitting gravels.





(Continuation Sheet)

PROJECT FMC Data Gap InvestigationREPORT NO. DGFI-2JOB NO. 10503311DATE 10/30/13

QUALITY CONTROL ACTIVITIES (INCLUDING FIELD CALIBRATIONS):

No field tests completed. Took approximate depth measurements of test pits

HEALTH AND SAFETY LEVELS AND ACTIVITIES:

Moderate Level D

PROBLEMS ENCOUNTERED/CORRECTIVE ACTION TAKEN:

None

SPECIAL NOTES:

None

TOMORROWS EXPECTATIONS:

No activities planned for tomorrow

DISTRIBUTION : 1. MW PROJECT MANAGER
2. PROJECT FILEPage 2 of 2SUBMITTED BY Chad Tomlinson TITLE Project Engineer**MWH**

APPENDIX C

Soil Boring Logs

BORING LOCATION 		Project: Data Gap Project No: 10503311		Boring ID: FMC-SB 3 Northing: 448827.0 Easting: 549003.4						
		Date Drilled: 11/12/13 Date Completed: 11/12/13 Logged By: B. Brandon		Ground Surface Elevation (ft.): 4447.8 Datum: NGVD (1988)						
		Water Elevation (ft.): NA Date Measured: NA								
		Total Depth (ft.): 30' Diameter (in.): 8"		Drilling Contractor: Cen-Tec / Job 6 Drilling Method: HSA						
		Abandonment Information: Back filled with soil cuttings								
DEPTH (FEET)	GRAIN SIZE			DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)						
	% GRAVEL	% SAND	% FINES	MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICATION	GRAPHIC LOG	
0	15	10			Shallow Tube / GR-#	ML				silt (ml) light gray (10VR 7/2) slightly to low plasticity, dry, few roots and organics, medium stiff
1										
2	10	5	30			GM				Pushed Shelby Tube 0-2' in second boring Rock @ 2' bgs unable to drive Shelby Tube from 2-4'
3										Silty fine & coarse gravel (G-M) light gray (10VR 7/2) low plasticity, medium dense, dry, sub rounded w/ few sub angular gravels
4						GM				Shelby Tube Not Collected in GM
5						C				

T ELEVATION
(FEET)
Tm
Bog

DEPTH (FEET)	GRAIN SIZE				MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE SAMPLE	RECOVERY	USCS/ASTM CLASSIFICAT.	GRAPHIC LOG	DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)		ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES										
5													1330
6													
7													
8													
9													
10	70 30 15	80	GP.										
11													1350
12													
13													
14													
15													

DEPTH (FEET)	GRAIN SIZE			MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICAT.	GRAPHIC LOG	Project: Data Gap Project No: 10503311 Boring ID.: FMR-3B-3		ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES							DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)		
15					120							1441
16	W 30 10	16			T GP					As Above w/ some silt (10%)		
17												
18												
19												
20	50 40 10	50	(GP)							fine to coarse sandy fill & coarse gravel, mainly fine gravel, yellowish brown (10% silt) dry, non plastic		
21		5								orange, sub rounded.		1449
22		6										
23												
24												
25												

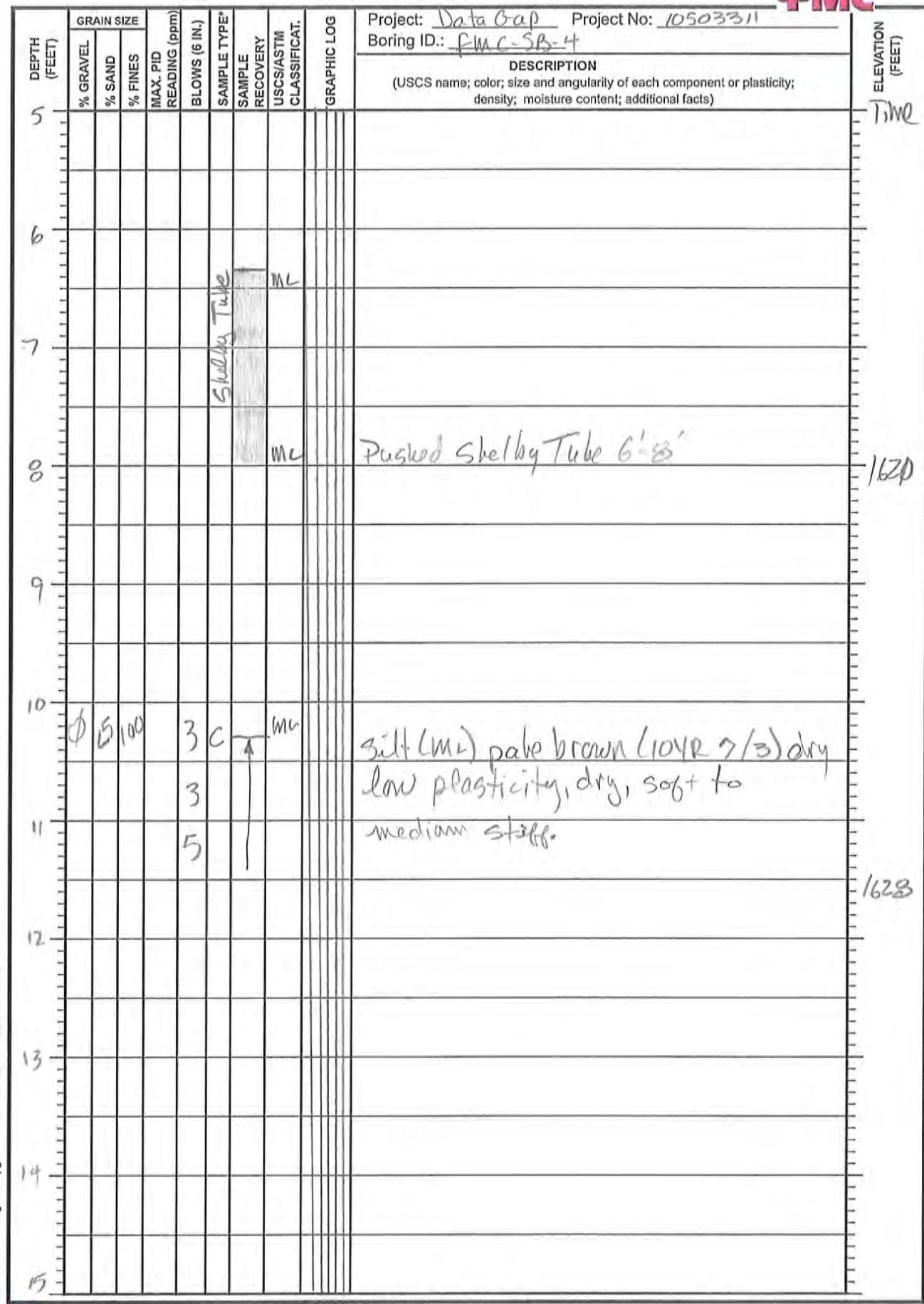
DEPTH (FEET)	GRAIN SIZE								MAX. PID READING (ppm)	SAMPLE TYPE	SAMPLE RECOVERY	USCS/ASTM CLASSIFICAT.	GRAPHIC LOG	Project: Data Gap Project No: 10503311 Boring ID.: FMC-SB-3		ELEVATION (FEET) TIME
	% GRAVEL	% SAND	% FINES	BLOWS (6 IN.)										DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)		
25				60	C				60							
26	Ø 15	100	0	1		ML										
27				11												1427
28																
29																
30	Ø 6	100	0	5	C		ML									
31				6												1437
32				8												

FMC

BORING LOCATION		Project: <u>Databeg</u> Project No: <u>1050331</u>						Boring ID: <u>FMC SB-4</u>		
		Date Drilled: <u>11/12/13</u> Date Completed: <u>11/12/13</u>			Northing: <u>448196.6</u> Easting: <u>549171.6</u>			Ground Surface Elevation (ft.): <u>4453.5</u>		
		Logged By: <u>B Branson</u>						Datum: NGVD (1988)		
		Water Elevation (ft.): <u>NA</u>								
		Date Measured: <u>NA</u>								
		Total Depth (ft.): <u>30'</u>						Drilling Contractor: <u>Cone Tec / Toff</u>		
		Diameter (in.): <u>8"</u>						Drilling Method: <u>HSA</u>		
		Abandonment Information: <u>Backfilled with Soil Cuttings</u>								
DEPTH (FEET)	% GRAVEL	GRAIN SIZE			DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)					
		% SAND	% FINE	MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICATION	GRAPHIC LOG	TIME ELEVATION (FEET)
1	100			SP-15	ML				1542	
2										
3										
4									1548	
5										

* C California Split Spoon Sampler (2.5" I.D.)
S Standard penetration test sampler
c Cuttings
▼ Elevation of ground water

PAGE 1 OF 4

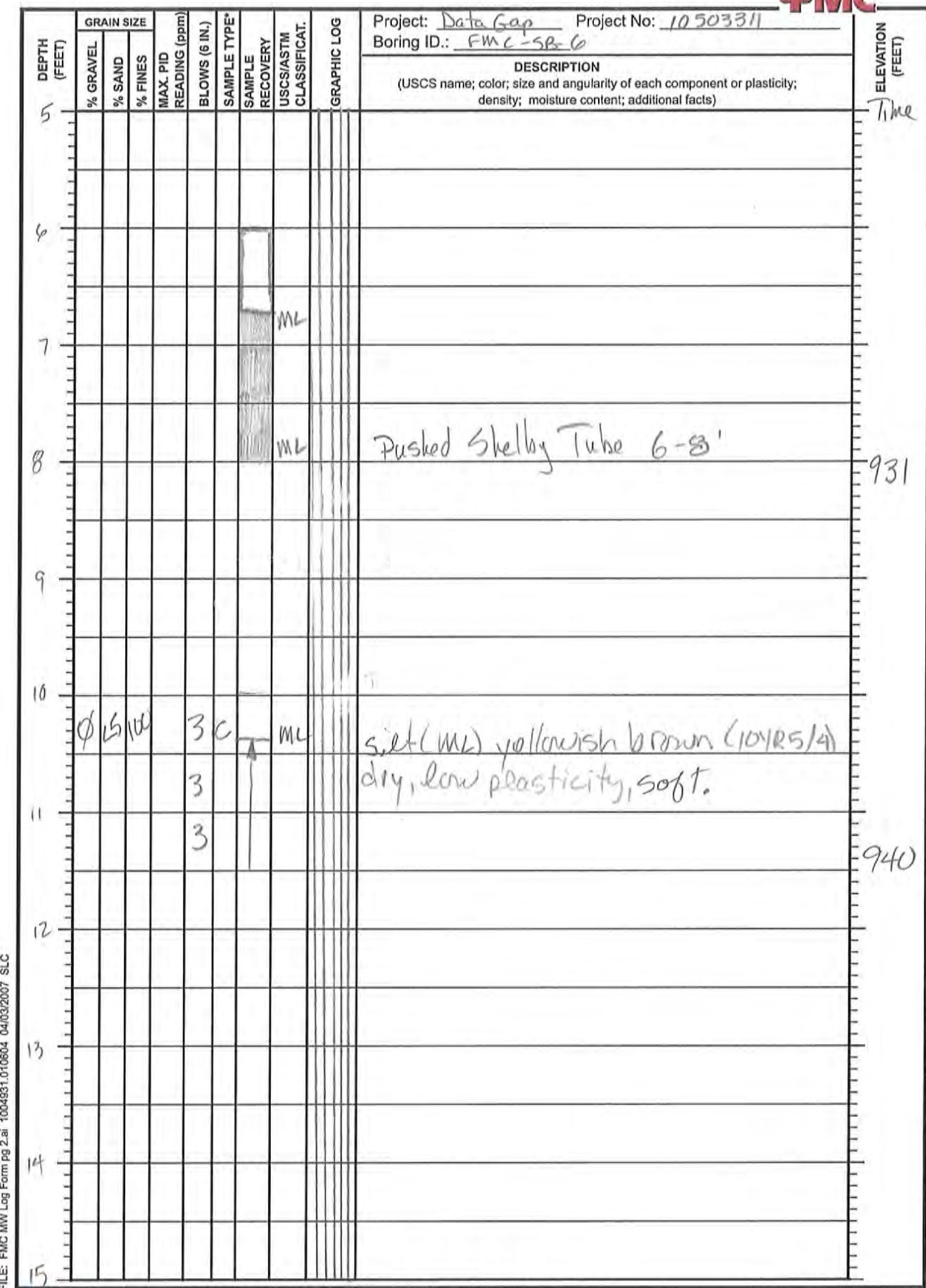


DEPTH (FEET)	GRAIN SIZE			MAX. P.D. READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICAT.	GRAPHIC LOG	DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)		ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES									
15	0	25	75	100	70	C	T	ML		Silt (ML), pale brown (10YR7/3) dry, low to slightly plastic, medium stiff to stiff.		
16					30							1645
17					10							
18												
19												
20	0	15	85	100	70	C	T	ML		Silt (ML), pale brown (10YR7/3) dry, low to slightly plastic, medium Stiff to stiff.		
21					14							1654
22					11							
23												
24					60					Under drilling about 23.5' Estimated top of Gravel.		
25												

DEPTH (FEET)	GRAIN SIZE				MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE	SAMPLE RECOVERY	USCS/ASTM CLASSIFICAT.	Project: Data Gap Project No: 10503311 Boring ID.: FMC-SB-4		ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES							DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)		
25					40	C						
26	10	30	60		30			↑ 98			fine to medium Sandy fine & coarse gravel (GP) w/ few cobbles, Pale brown (COVR 7/3), dry, non plastic to slightly plastic where silty, Dense	1720
27												
28												
29												
30	10	30	60		6 C	GP					fine to medium sandy fine & coarse gravel (GP), Pale brown (COVR 7/3) dry, non plastic, medium dense to dense. TD = 30' w/ HSA 31.5' w/ split sp. Back filled with soil cuttings from boring -	1735
					7			↑				
					19							

FMC

BORING LOCATION		Project: <u>FMC</u> Project No: <u>10503311</u>						
		Date Drilled: <u>1/13/13</u> Date Completed: <u>1/13/13</u>			Boring ID: <u>FMC-SP-6</u> Northing: <u>441529.7</u> Easting: <u>527237.3</u>			
		Logged By: <u>BILL BRAGGARD</u>			Ground Surface Elevation (ft.): <u>4454.9</u> Datum: NGVD (1988)			
		Water Elevation (ft.): <u>NA</u> Date Measured: <u>NA</u>						
		Total Depth (ft.): <u>30'</u> Diameter (in.): <u>8"</u>			Drilling Contractor: <u>Cone Tec / Jeff</u> Drilling Method: <u>HSA</u>			
		Abandonment Information: <u>Back filled with soil cuttings.</u>						
DEPTH (FEET)	GRAIN SIZE		MAX. PID READING (ppm)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICATION	GRAPHIC LOG	DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)
	% GRAVEL	% SAND						
1	15	100		GRAPH	ML			Silt (ML) light gray (10YR 7/2) to Pale brown (10YR 7/3), slightly to low plasticity, medium stiff, few roots and organics.
2								
3								
4								Dashed Shelby Tube 2'-4'
5								



DEPTH (FEET)	GRAIN SIZE				MAX. PID READING (PPM)	BLOWS (6 IN.)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICAT.	GRAPHIC LOG	Project: Data Gap Project No: 10503311 Boring ID.: FMC SB-6		ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES								DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)		
15	Ø	15	10		6	C	ML				silt (ML) yellowish brown (10YR 5/4) dry to slightly moist, slightly plastic, medium stiff.	Time	
16					8								949
17					8								
18													
19													
20					8	C							
21	60	30	10		10		ML				ML as above @ 15'		
22					20		GP				fine to medium sandy fine & coarse gravel (GP), Pale Brown (10YR 6/3)	959	
23											NP, dry, medium dense. Fine to medium grained gritzite subrounded gravel.		
24													
25													

DEPTH (FEET)	GRAIN SIZE			MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE	SAMPLE RECOVERY	USCS/ASTM CLASSIFICAT.	GRAPHIC LOG	Project: Data Gap Project No: 10503311 Boring ID.: FMC SB6		ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES							DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)		
25					13C		GP					TIME
26	60	30	10		18		↑			As Above @ 21' bgs		1022
27												
28												
29												
30					100	GP				TD w/ augers 30'		
					18					As above @ 21' bgs. Weak Floc on glzite.		
					60	30	10	26	↑	TD w/ SPT 31.5 Back filled with soil cuttings around boring.		1035



FMC

BORING LOCATION		Project: <u>Data Gap</u> Project No: <u>10503311</u>									
		Date Drilled: <u>11/13/13</u>	Date Completed: <u>11/13/13</u>	Logged By: <u>Bill Bragdon</u>	Boring ID: <u>FMC-SB-7</u>	Northing: <u>448295.4</u>	Eastng: <u>547160.5</u>				
		Water Elevation (ft.): <u>NA</u>	Date Measured: <u>NA</u>	Ground Surface Elevation (ft.): <u>4452.9</u>							
		Total Depth (ft.): <u>30'</u>	Diameter (in.): <u>33"</u>	Datum: NGVD (1988)							
		Abandonment Information: <u>Backfilled with soil cuttings</u>									
DEPTH (FEET)	DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)						ELEVATION (FEET)				
	% GRAVEL	% SAND	% FINES	MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*		SAMPLE RECOVERY	USCS/ASTM CLASSIFICATION	GRAPHIC LOG	
0	15	15			GRAN		ML			Silt (ML), pale brown (10YR 6/3) Slightly to low plasticity, medium stiff, dry.	TIME 1103
1							ML				
2							ML				
3							ML				
4							ML			Pushed Shelby Tube Z-4'	1115
5											

* C California Split Spoon Sampler (2.5" I.D.)
 S Standard penetration test sampler
 c Cuttings
 ▼ Elevation of ground water

DEPTH (FEET)	GRAIN SIZE				MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICAT.	GRAPHIC LOG	DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)	ELEVATION (FEET)	TIME
	% GRAVEL	% SAND	% FINES										
5													
6													
7													
8													
9													
10													
10.5	10	40	ML										1140
11													
11.5	5												
12													
13													
14													
15													

Pushed Shelby Tube 6'-8'

Pushed Shelby Tube 12'-14'

Shelby Tube

ML

ML

Silt (ML) very pale brown (10YR 7/2)
dry, low to slightly plastic
soft to medium stiff.

1140

1142

1202

DEPTH (FEET)	GRAIN SIZE						GRAPHIC LOG	DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)	ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES	MAX. PID READING (DDM)	BLOWS (6 IN.)	SAMPLE TYPE*			
15	10	80	40	5	C	ML		Silty fine to coarse sand (sm) Pale brown (10YR 6/4), dry	Time
16				7		SM		Non plastic to slightly plastic Where silty.	1209
17				6					
18									
19									
20	10	50	40	7	C	ML		Silt (ml) pale brown (10YR 6/4) dry, low to slightly plastic medium	1216
21				8				Stiff to stiff.	1216
22				12					
23									
24									
25				6P				Harder drilling. Estimated top of Gravel.	

DEPTH (FEET)	GRAIN SIZE							Project: Darga Gap Project No: 10503311 Boring ID.: FMC SB-7	DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)	ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES	MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*	USCS/ASTM CLASSIFICAT.			
25	10	10	15	38	C	GP	GP		fine to coarse sandy fine & coarse gravel(GP) light gray(10YR 6/2)	Time
26				22	↑				MW plastic, dry, medium dense to dense, subrounded.	1226
27										
28										
29										
30	60	30	10	14	C	GP	GP		fine to coarse sandy fine & coarse gravel(GP) w/some Silt, few cobbles	1237
				18	↑				generally light gray(10YR 6/2) to yellowish brown (10YR 5/4) dry, medium dense, subrounded gravel	
				21						
									TD w/HSA 30' TD w/Sampler 31.5'	
									Back filled w/soil from boring.	

FMC

BORING LOCATION		Project: Data 600 Project No: 1050331 Date Drilled: 11/13/13 Date Completed: 11/13/13 Logged By: Bill Bradson Water Elevation (ft.): NA Date Measured: NA Total Depth (ft.): 30' Diameter (in.): 8" Abandonment Information: Back filled with soil cuttings.							Boring ID: FMC-SB-8 Northing: 449010.0 Easting: 541945 Ground Surface Elevation (ft.): 4A51.7 Datum: NGVD (1988)		
DEPTH (FEET)	ELEVATION (FEET)	% GRAVEL	% SAND	% FINES	MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICATION	GRAPHIC LOG	DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)
0	1305	15	10	NA			GR-A-3		ML		Silt (ML) pale brown (10YR 6/3) to yellowish brown (10YR 5/4), slightly moist, slightly to low plasticity.
1											medium stiff, few roots & organics
2	1318										
3											
4	1325										Pushed Shelby Tube 2'-4'
5											

DEPTH (FEET)	GRAIN SIZE				GRAPHIC LOG	DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)	ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES	MAX. P.D. READING (DPD)			
5							Time
6							
7							
8						Pushed Shelby Tube 6'-8'	1334
9							
10	φ 6 (Ø)	30	ML			Silt (ML) pale brown (10YR 6/3) dry, low to slightly plastic	
11		7	T			Medium stiff to stiff	1343
12		9					
13							
14							
15							

DEPTH (FEET)	GRAIN SIZE			MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICAT.	GRAPHIC LOG	Project: Data Gap Project No: 10503311		ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES							DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)		
15	φ	15	100	4	C	ML				Silt (ml) pale brown (10YR 6/3) low to slightly plastic, dry,		Time
16		6			8					soft to medium stiff		1351
17												
18												
19												
20	φ	15	100	8	C	ML				Silt (ml) pale brown (10YR 6/3) low to slightly plasticity, dry, medium		
21		7								stiff.		1400
22		9										
23												
24												
25												

DEPTH (FEET)	GRAIN SIZE			MAX. PID READING (ppm)	BLOWS (6 IN.)	SAMPLE TYPE*	SAMPLE RECOVERY	USCS/ASTM CLASSIFICAT.	GRAPHIC LOG	Project: Data Gap Project No: 10503311 Boring ID.: FMC-SB-8		ELEVATION (FEET)
	% GRAVEL	% SAND	% FINES							DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; additional facts)		
25	φ	5	100		8 C ↑	ML				Silt (ML) pale brown (10YR 6/3) to moderate yellowish brown (10YR 5/4) dry, slightly to low plasticity medium stiff to stiff	Time	
26					9							1417
27					15							
28												
29												
30	φ	5	100		8 C ↑	ML				Silt (ML) moderate yellowish brown (10YR 5/4), dry, low to slightly plastic, medium stiff to stiff. Gravel caught in shoe, very hard the last 3" of run TDW/HSA 30' w/ SPT 315'	1440	
					13							
					22	GP	● ●					
										Backfilled with soil cuttings from boring.		

APPENDIX D

Geotechnical and Hydrological Testing Reports

Water Content and Unit Weight of Soil

(In General Accordance with ASTM D7263 Method B and D2216)



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Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

Date: 11/27/2013

By: JDF

Sample Info.	Boring No.	SB8	SB8	SB3	SB4	SB4	SB6	SB6	SB7
	Sample:								
	Depth:	2-4'	6-8'	0-2'	2-4'	6-8'	2-4'	6-8'	2-4'
Unit Weight Info.	Sample height, H (in)	4.427	4.492	4.663	4.000	6.051	4.409	5.159	4.921
	Sample diameter, D (in)	2.885	2.882	2.883	2.884	2.884	2.882	2.882	2.883
	Sample volume, V (ft³)	0.0167	0.0170	0.0176	0.0151	0.0229	0.0166	0.0195	0.0186
	Mass rings + wet soil (g)	1721.56	1721.15	1848.02	1801.18	2045.31	1763.78	1151.00	1797.87
	Mass rings/tare (g)	1068.76	1075.67	1087.08	1244.25	1186.90	1067.18	361.78	1111.81
	Moist soil, Ws (g)	652.80	645.48	760.94	556.93	858.41	696.60	789.22	686.06
	Moist unit wt., γ_m (pcf)	85.93	83.92	95.23	81.20	82.73	92.27	89.34	81.36
	Wet soil + tare (g)	768.44	738.89	477.75	661.30	430.10	524.88	587.23	354.56
Water Content	Dry soil + tare (g)	718.97	690.41	461.22	636.71	413.13	472.91	547.48	324.20
	Tare (g)	126.82	124.36	124.42	124.41	128.35	127.69	123.36	128.51
Water Content, w (%)		8.4	8.6	4.9	4.8	6.0	15.1	9.4	15.5
Dry Unit Wt., γ_d (pcf)		79.3	77.3	90.8	77.5	78.1	80.2	81.7	70.4

Entered by:_____

Reviewed:_____

Water Content and Unit Weight of Soil

(In General Accordance with ASTM D7263 Method B and D2216)



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Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

Date: 12/16/2013

By: JDF

Sample Info.	Boring No.	SB7	SB7						
	Sample:								
	Depth:	6-8'	12-14'						
Unit Weight Info.	Sample height, H (in)	2.770	4.443						
	Sample diameter, D (in)	2.884	2.798						
	Sample volume, V (ft ³)	0.0105	0.0158						
	Mass rings + wet soil (g)	628.36	800.26						
	Mass rings/tare (g)	152.04	168.60						
	Moist soil, Ws (g)	476.32	631.66						
	Moist unit wt., γ_m (pcf)	100.28	88.08						
	Wet soil + tare (g)	296.80	754.94						
	Dry soil + tare (g)	287.40	738.11						
Water Content	Tare (g)	128.47	223.39						
	Water Content, w (%)	5.9	3.3						
	Dry Unit Wt., γ_d (pcf)	94.7	85.3						

Entered by:_____

Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

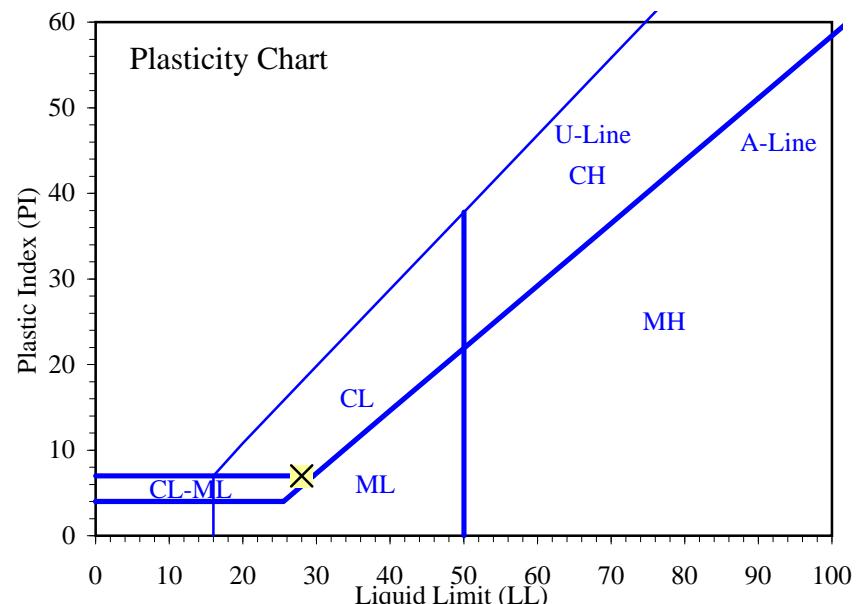
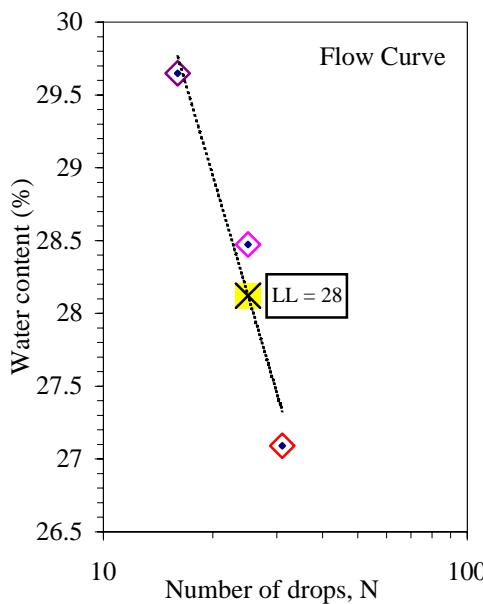
Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/12/2013****By: BRR****Boring No.: WUA-TP001-01****Sample:****Depth: 1-10'****Description: Brown silty clay**Preparation method: **Air Dry**Liquid limit test method: **Multipoint****Plastic Limit**

Determination No	1	2				
Wet Soil + Tare (g)	31.64	32.88				
Dry Soil + Tare (g)	30.00	31.03				
Water Loss (g)	1.64	1.85				
Tare (g)	22.14	22.07				
Dry Soil (g)	7.86	8.96				
Water Content, w (%)	20.87	20.65				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	31	25	16			
Wet Soil + Tare (g)	31.38	30.95	32.16			
Dry Soil + Tare (g)	29.34	28.88	29.88			
Water Loss (g)	2.04	2.07	2.28			
Tare (g)	21.81	21.61	22.19			
Dry Soil (g)	7.53	7.27	7.69			
Water Content, w (%)	27.09	28.47	29.65			
One-Point LL (%)		28				

Liquid Limit, LL (%)	28
Plastic Limit, PL (%)	21
Plasticity Index, PI (%)	7



Entered by: _____

Reviewed: _____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)



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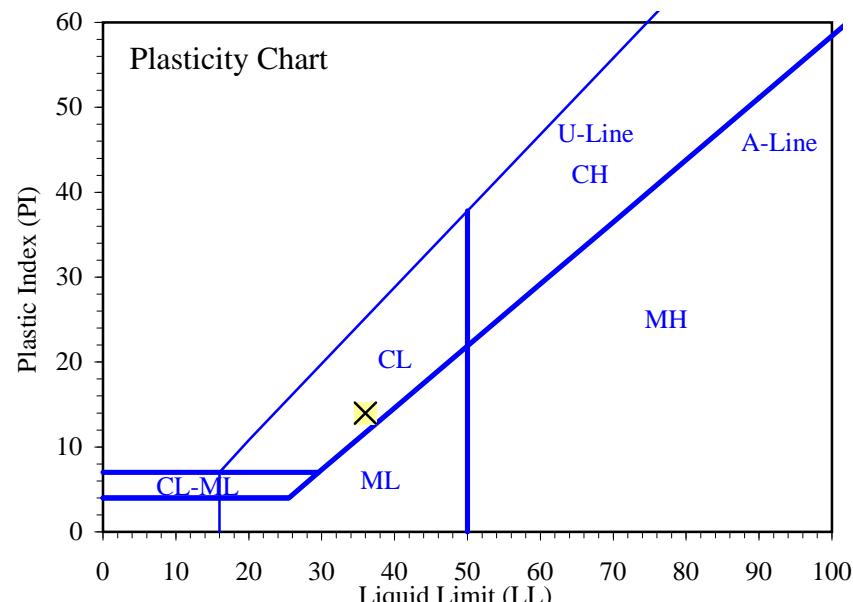
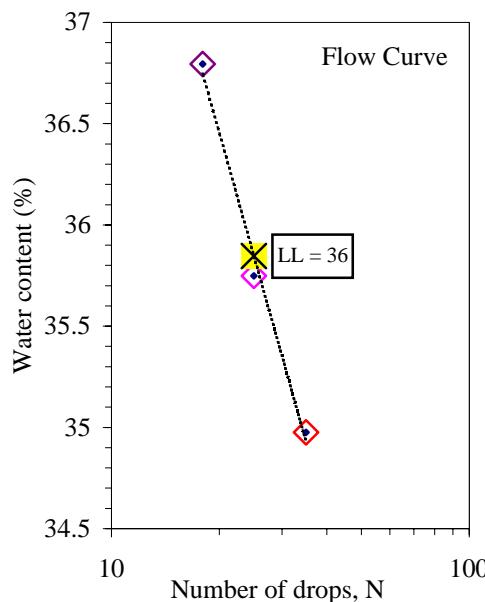
Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/12/2013****By: BRR****Boring No.: WUA-TP002-01****Sample:****Depth: 1-10'****Description: Brown lean clay**Preparation method: Air Dry
Liquid limit test method: Multipoint**Plastic Limit**

Determination No	1	2				
Wet Soil + Tare (g)	30.52	29.74				
Dry Soil + Tare (g)	29.02	28.38				
Water Loss (g)	1.50	1.36				
Tare (g)	22.04	22.12				
Dry Soil (g)	6.98	6.26				
Water Content, w (%)	21.49	21.73				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	35	25	18			
Wet Soil + Tare (g)	30.40	30.70	30.85			
Dry Soil + Tare (g)	28.20	28.43	28.37			
Water Loss (g)	2.20	2.27	2.48			
Tare (g)	21.91	22.08	21.63			
Dry Soil (g)	6.29	6.35	6.74			
Water Content, w (%)	34.98	35.75	36.80			
One-Point LL (%)		36				

Liquid Limit, LL (%)	36
Plastic Limit, PL (%)	22
Plasticity Index, PI (%)	14



Entered by: _____

Reviewed: _____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)



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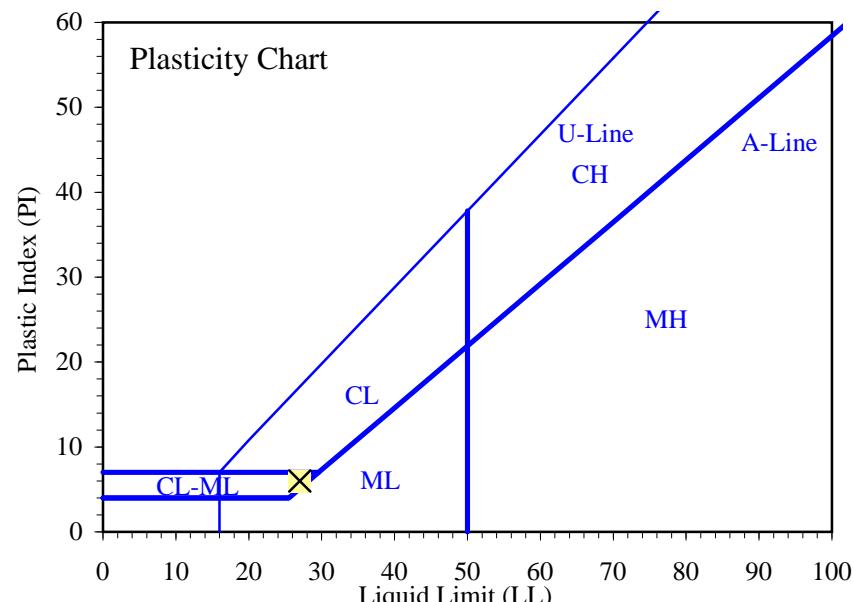
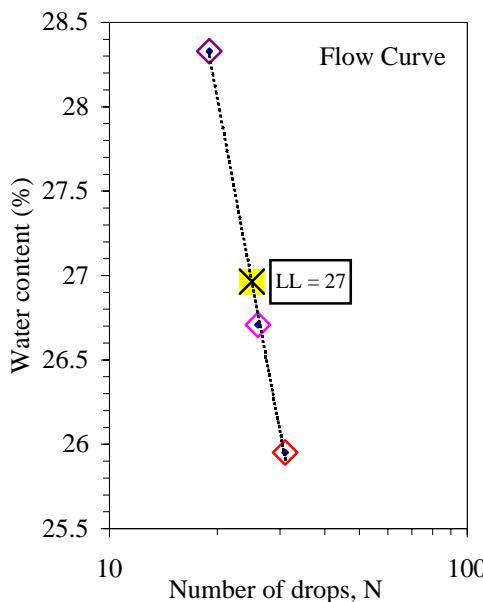
Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/12/2013****By: BRR****Boring No.: WUA-TP003-01****Sample:****Depth: 1-10'****Description: Brown silty clay**Preparation method: **Air Dry**Liquid limit test method: **Multipoint****Plastic Limit**

Determination No	1	2				
Wet Soil + Tare (g)	30.10	32.41				
Dry Soil + Tare (g)	28.69	30.62				
Water Loss (g)	1.41	1.79				
Tare (g)	22.05	22.08				
Dry Soil (g)	6.64	8.54				
Water Content, w (%)	21.23	20.96				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	31	26	19			
Wet Soil + Tare (g)	30.69	30.15	30.75			
Dry Soil + Tare (g)	28.85	28.43	28.75			
Water Loss (g)	1.84	1.72	2.00			
Tare (g)	21.76	21.99	21.69			
Dry Soil (g)	7.09	6.44	7.06			
Water Content, w (%)	25.95	26.71	28.33			
One-Point LL (%)		27				

Liquid Limit, LL (%)	27
Plastic Limit, PL (%)	21
Plasticity Index, PI (%)	6



Entered by: _____

Reviewed: _____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)



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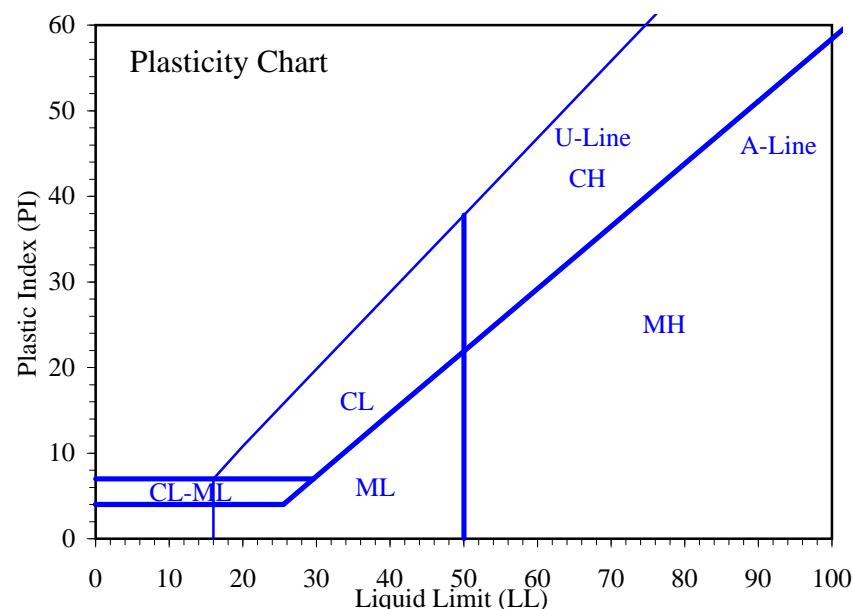
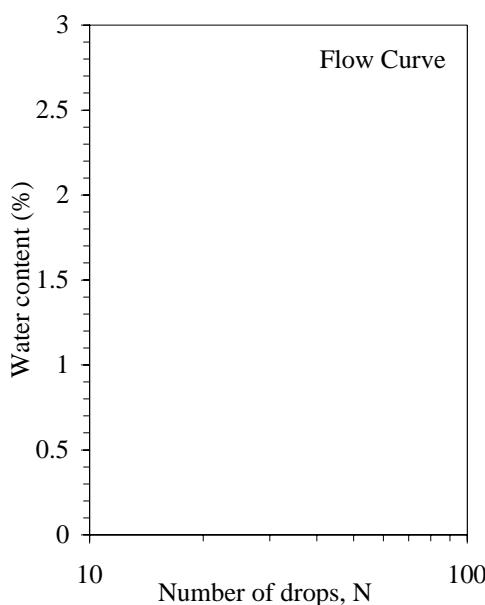
Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/14/2013****By: BRR****Boring No.: WUA-TP004-01****Sample:****Depth: 1-10'****Description: Brown silt**Preparation method: **Air Dry**Liquid Limit: **Could not be determined (N.P.)****Plastic Limit**

Determination No						
Wet Soil + Tare (g)						
Dry Soil + Tare (g)		Difficult to thread.				
Water Loss (g)						
Tare (g)						
Dry Soil (g)						
Water Content, w (%)						

Liquid Limit: Could not be determined (N.P.)

Determination No						
Number of Drops, N						
Wet Soil + Tare (g)		Unable to obtain an adequate blow count.				
Dry Soil + Tare (g)						
Water Loss (g)						
Tare (g)						
Dry Soil (g)						
Water Content, w (%)						
One-Point LL (%)						

Liquid Limit, LL (%)	Nonplastic (N.P.)
Plastic Limit, PL (%)	
Plasticity Index, PI (%)	



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Reviewed: _____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

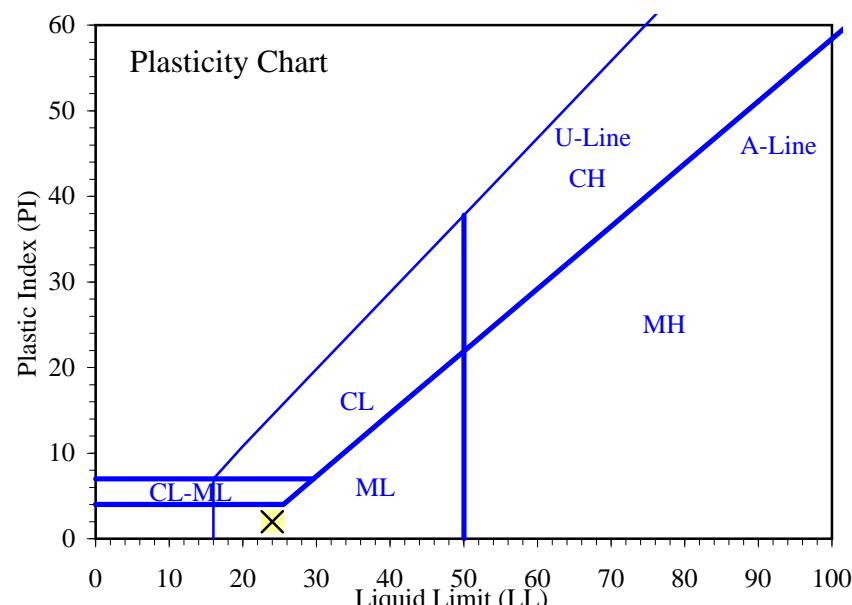
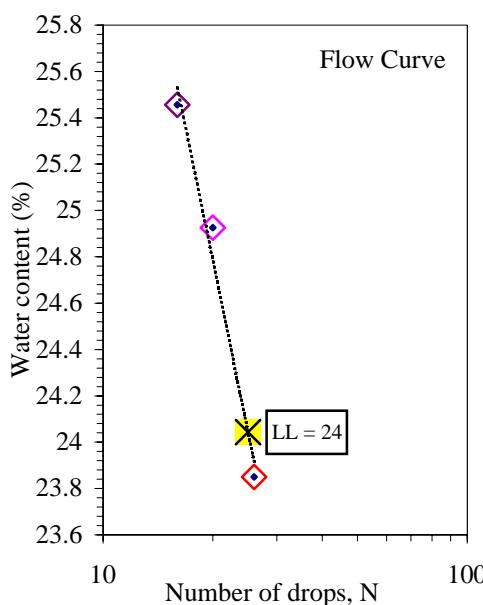
 **IGES**
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Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/14/2013****By: BRR****Boring No.: WUA-TP005-01****Sample:****Depth: 1-10'****Description: Brown silt**
 Preparation method: Air Dry
 Liquid limit test method: Multipoint
Plastic Limit

Determination No	1	2				
Wet Soil + Tare (g)	29.97	33.78				
Dry Soil + Tare (g)	28.49	31.70				
Water Loss (g)	1.48	2.08				
Tare (g)	21.64	22.04				
Dry Soil (g)	6.85	9.66				
Water Content, w (%)	21.61	21.53				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	26	20	16			
Wet Soil + Tare (g)	33.17	30.30	33.04			
Dry Soil + Tare (g)	30.89	28.62	30.81			
Water Loss (g)	2.28	1.68	2.23			
Tare (g)	21.33	21.88	22.05			
Dry Soil (g)	9.56	6.74	8.76			
Water Content, w (%)	23.85	24.93	25.46			
One-Point LL (%)	24	24				

Liquid Limit, LL (%)	24
Plastic Limit, PL (%)	22
Plasticity Index, PI (%)	2



Entered by: _____

Reviewed: _____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)



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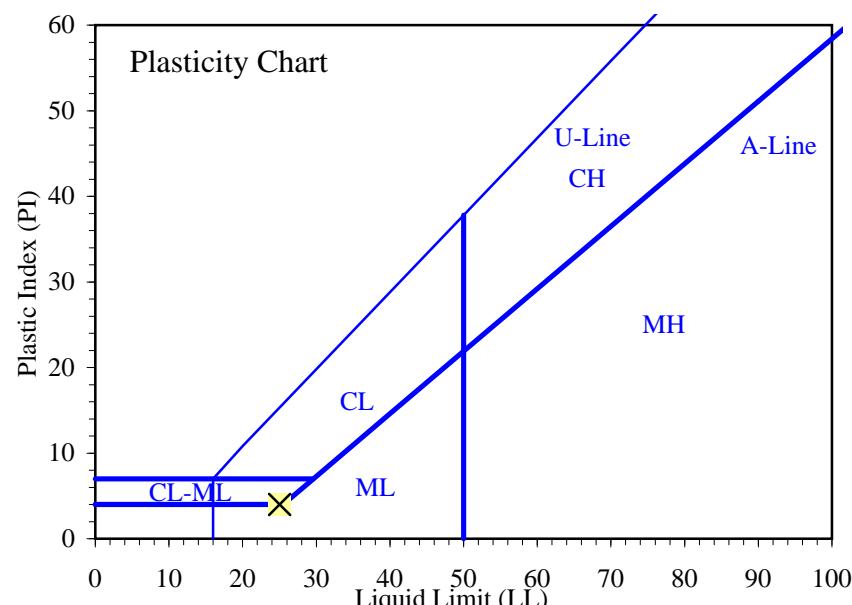
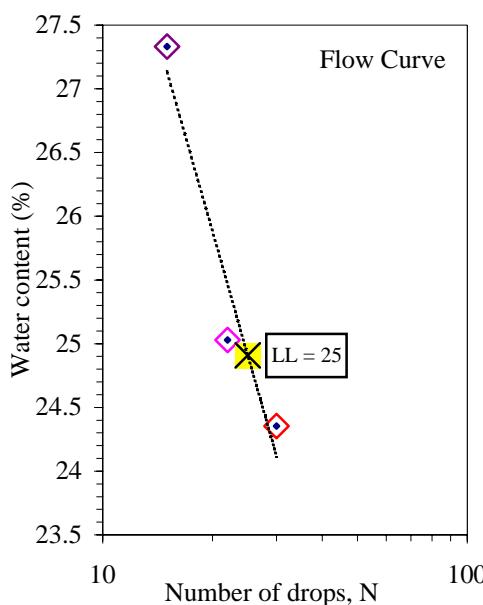
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Determination No	1	2				
Wet Soil + Tare (g)	31.07	31.18				
Dry Soil + Tare (g)	29.41	29.55				
Water Loss (g)	1.66	1.63				
Tare (g)	21.70	21.80				
Dry Soil (g)	7.71	7.75				
Water Content, w (%)	21.53	21.03				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	30	22	15			
Wet Soil + Tare (g)	32.11	32.92	31.87			
Dry Soil + Tare (g)	30.13	30.69	29.76			
Water Loss (g)	1.98	2.23	2.11			
Tare (g)	22.00	21.78	22.04			
Dry Soil (g)	8.13	8.91	7.72			
Water Content, w (%)	24.35	25.03	27.33			
One-Point LL (%)	25	25				

Liquid Limit, LL (%)	25
Plastic Limit, PL (%)	21
Plasticity Index, PI (%)	4



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Reviewed: _____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)



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Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/12/2013****By: BRR****Boring No.: WUA-TP007-01****Sample:****Depth: 1-10'****Description: Brown silt**

Preparation method: Air Dry
 Liquid limit test method: Multipoint

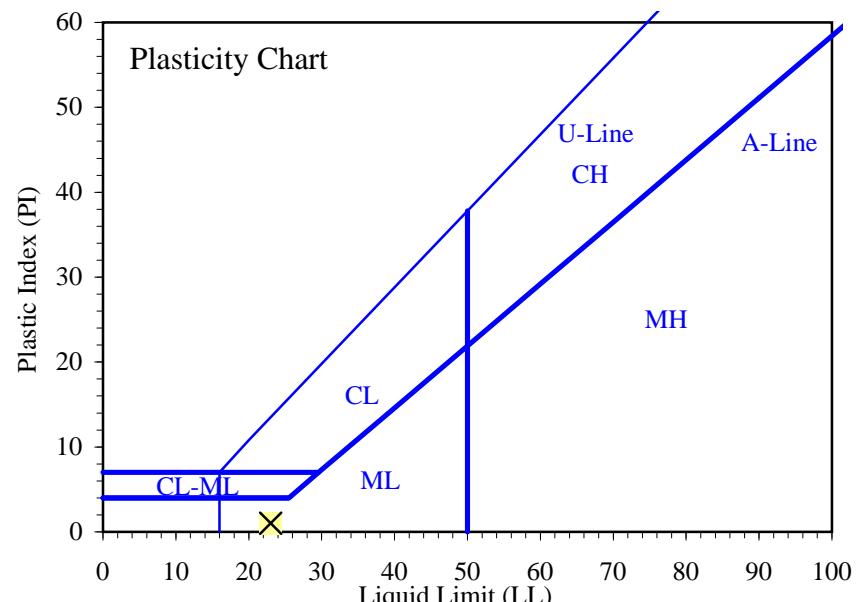
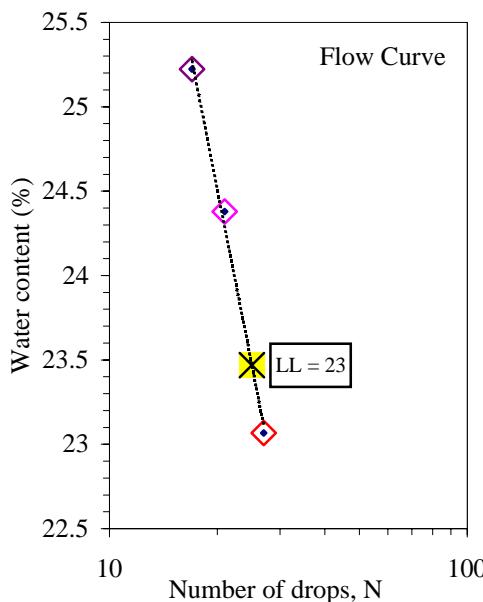
Plastic Limit

Determination No	1	2				
Wet Soil + Tare (g)	29.81	30.38				
Dry Soil + Tare (g)	28.31	28.86				
Water Loss (g)	1.50	1.52				
Tare (g)	21.57	21.95				
Dry Soil (g)	6.74	6.91				
Water Content, w (%)	22.26	22.00				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	27	21	17			
Wet Soil + Tare (g)	31.03	30.86	31.60			
Dry Soil + Tare (g)	29.30	29.09	29.62			
Water Loss (g)	1.73	1.77	1.98			
Tare (g)	21.80	21.83	21.77			
Dry Soil (g)	7.50	7.26	7.85			
Water Content, w (%)	23.07	24.38	25.22			
One-Point LL (%)	23	24				

Liquid Limit, LL (%)	23
Plastic Limit, PL (%)	22
Plasticity Index, PI (%)	1



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Reviewed: _____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)



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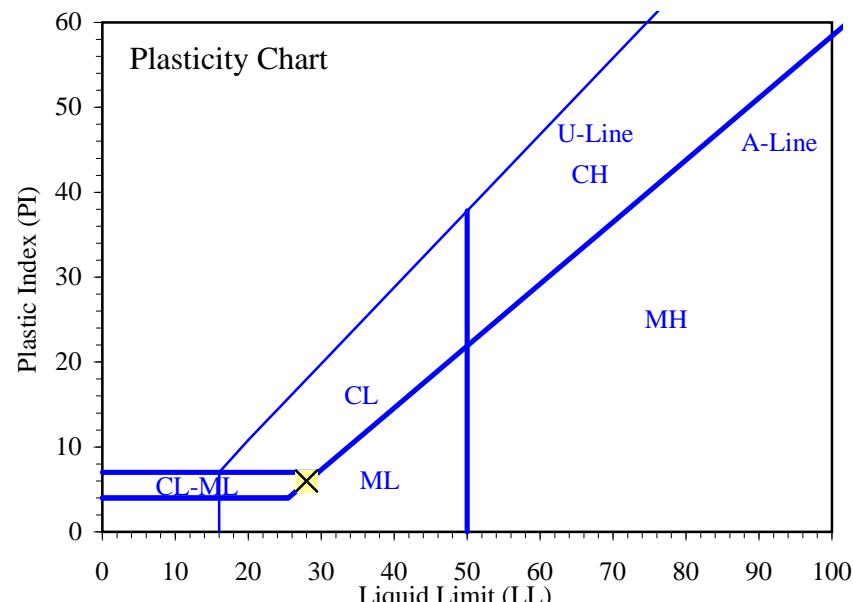
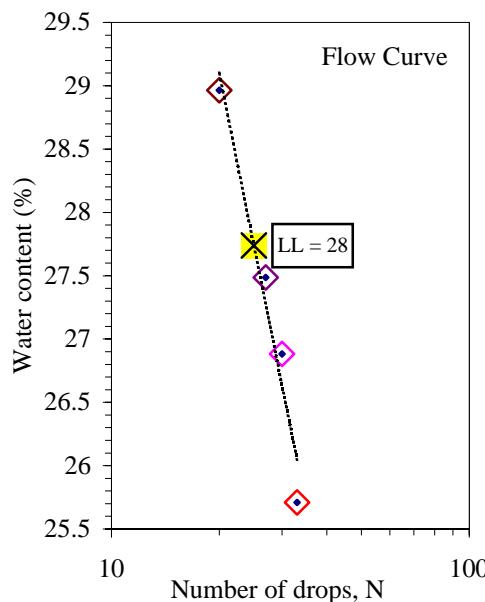
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Liquid limit test method: Multipoint**Plastic Limit**

Determination No	1	2				
Wet Soil + Tare (g)	32.87	34.54				
Dry Soil + Tare (g)	30.87	32.20				
Water Loss (g)	2.00	2.34				
Tare (g)	21.88	21.71				
Dry Soil (g)	8.99	10.49				
Water Content, w (%)	22.25	22.31				

Liquid Limit

Determination No	1	2	3	4		
Number of Drops, N	33	30	27	20		
Wet Soil + Tare (g)	29.73	31.35	31.06	31.18		
Dry Soil + Tare (g)	28.10	29.35	29.07	29.08		
Water Loss (g)	1.63	2.00	1.99	2.10		
Tare (g)	21.76	21.91	21.83	21.83		
Dry Soil (g)	6.34	7.44	7.24	7.25		
Water Content, w (%)	25.71	26.88	27.49	28.97		
One-Point LL (%)		27	28	28		

Liquid Limit, LL (%)	28
Plastic Limit, PL (%)	22
Plasticity Index, PI (%)	6



Entered by: _____

Reviewed: _____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)



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Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/12/2013****By: BRR****Boring No.: WUA-TP009-01****Sample:****Depth: 1-10'****Description: Brown silty clay**

Preparation method: Air Dry
 Liquid limit test method: Multipoint

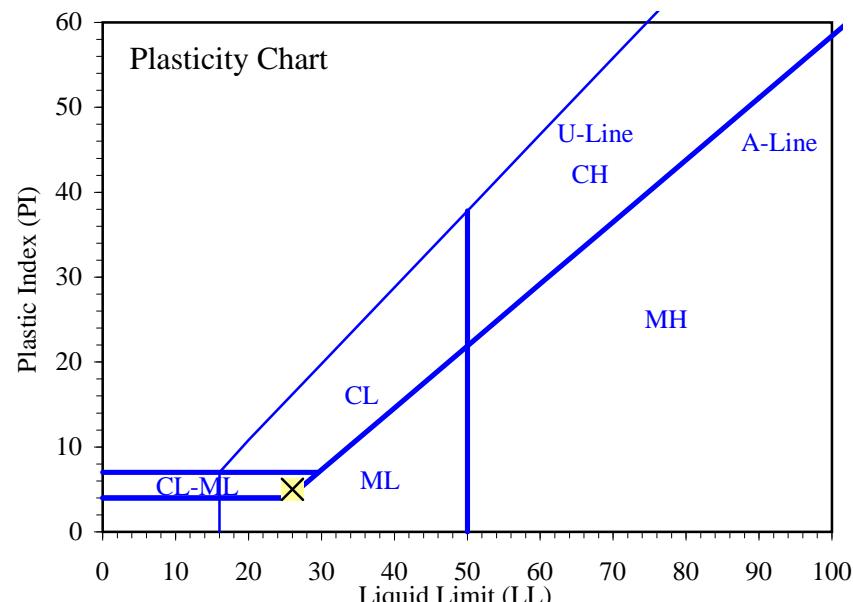
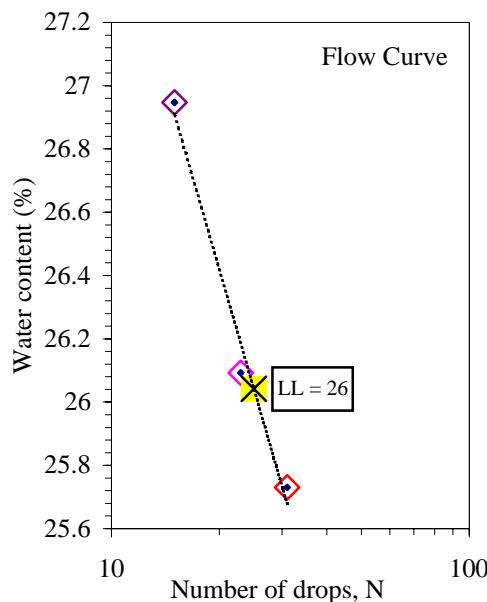
Plastic Limit

Determination No	1	2				
Wet Soil + Tare (g)	31.58	32.40				
Dry Soil + Tare (g)	29.88	30.55				
Water Loss (g)	1.70	1.85				
Tare (g)	21.85	21.71				
Dry Soil (g)	8.03	8.84				
Water Content, w (%)	21.17	20.93				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	31	23	15			
Wet Soil + Tare (g)	30.83	31.90	32.25			
Dry Soil + Tare (g)	28.98	29.81	30.07			
Water Loss (g)	1.85	2.09	2.18			
Tare (g)	21.79	21.80	21.98			
Dry Soil (g)	7.19	8.01	8.09			
Water Content, w (%)	25.73	26.09	26.95			
One-Point LL (%)		26				

Liquid Limit, LL (%)	26
Plastic Limit, PL (%)	21
Plasticity Index, PI (%)	5



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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)



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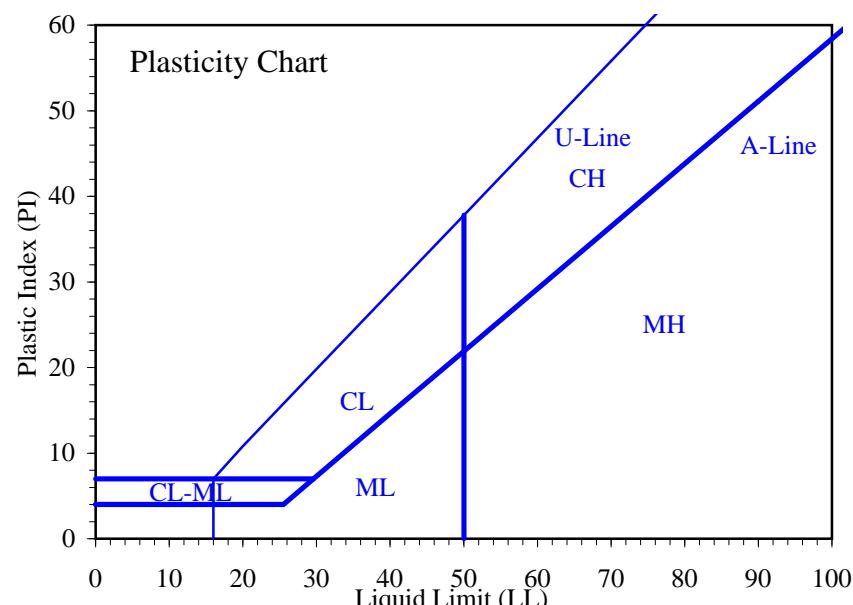
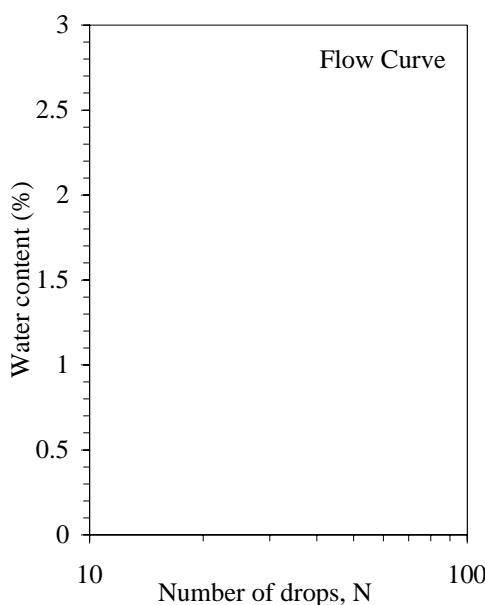
Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/14/2013****By: BRR****Boring No.: WUA-TP010-001****Sample:****Depth: 1-10'****Description: Brown silt**Preparation method: **Air Dry**Liquid Limit: **Could not be determined (N.P.)****Plastic Limit**

Determination No						
Wet Soil + Tare (g)						
Dry Soil + Tare (g)		Difficult to thread.				
Water Loss (g)						
Tare (g)						
Dry Soil (g)						
Water Content, w (%)						

Liquid Limit: Could not be determined (N.P.)

Determination No						
Number of Drops, N						
Wet Soil + Tare (g)		Unable to obtain an adequate blow count.				
Dry Soil + Tare (g)						
Water Loss (g)						
Tare (g)						
Dry Soil (g)						
Water Content, w (%)						
One-Point LL (%)						

Liquid Limit, LL (%)	Nonplastic (N.P.)
Plastic Limit, PL (%)	
Plasticity Index, PI (%)	



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Dispersive Characteristics of Clay Soil by Double Hydrometer

(ASTM D 4221)

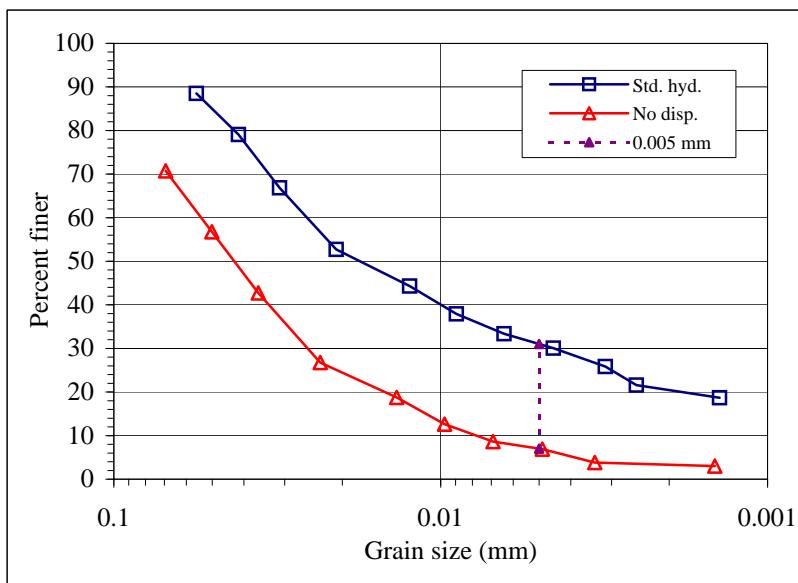


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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP001-01**Sample:****Depth:** 1-10'**Description:** Brown silty clay

Percent passing 5 um (ASTM D 4221) =	7.00
Percent passing 5 um (ASTM D 422) =	31.02
Percent Dispersion =	22.5

Standard Hyd. (ASTM D 422)		Double Hyd. (ASTM D 4221)	
I	J	I	J
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0559	88.5	0.0694	70.7
0.0415	79.1	0.0501	56.7
0.0311	66.9	0.0361	42.7
0.0209	52.7	0.0234	26.7
0.0124	44.3	0.0136	18.7
0.0090	37.9	0.0097	12.6
0.0064	33.4	0.0069	8.6
0.0045	30.1	0.0049	6.9
0.0031	25.9	0.0034	3.8
0.0025	21.6	0.0014	3.0
0.0014	18.7		



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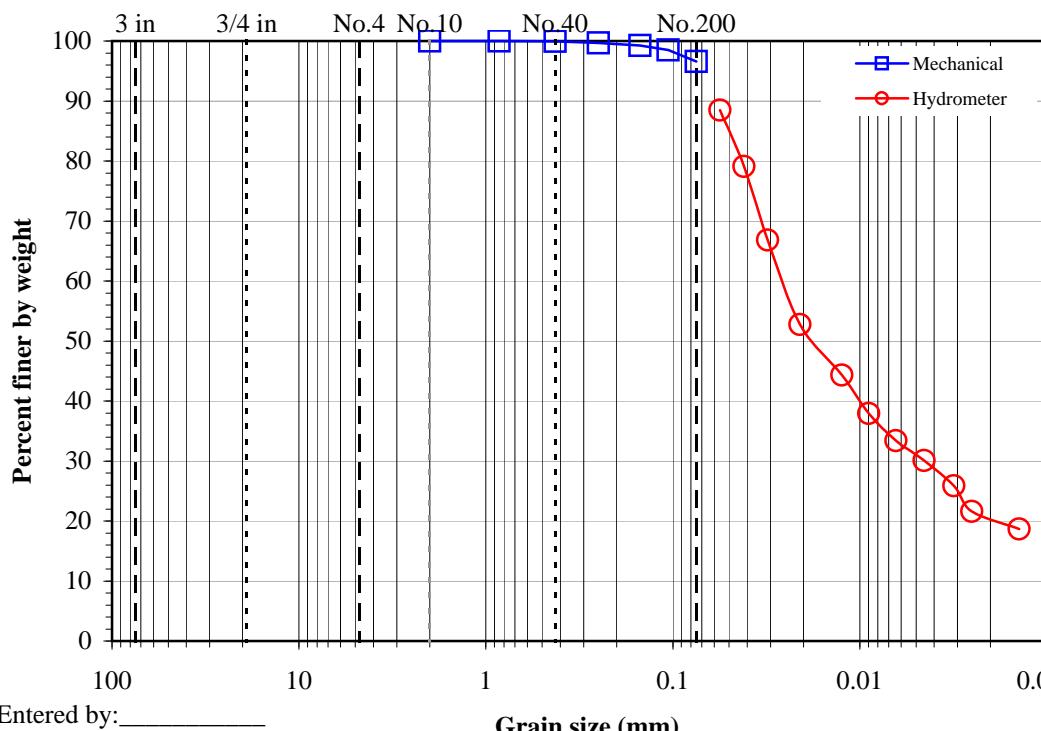
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Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP001-01****Sample:****Depth: 1-10'****Description: Brown silty clay**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	-	92.41	92.41	
Split sieve:	#10			Dry soil + tare (g):	-	90.93	90.93	
		Moist	Dry	Tare (g):	-	37.69	37.69	
Total sample wt. (g):	54.59	53.11		Water content (%):	0.00	2.78	2.78	
+#10 Coarse fraction (g):		0.00		Hydrometer data		Slope: -0.1641		
-#10 Split fraction (g):	54.59	53.11		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	54.59	53.11		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Dispersion period (min):	15	Dispersion device:	Air-jet	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	17.7	51	0.05593	88.50
6"	-	150	-	1	17.7	46	0.04154	79.09
4"	-	100	-	2	17.7	39.5	0.03112	66.85
3"	-	75	-	5	17.7	32	0.02088	52.73
1.5"	-	37.5	-	15	17.8	27.5	0.01244	44.30
3/4"	-	19	-	30	18.3	24	0.00895	37.92
3/8"	-	9.5	-	60	18.7	21.5	0.00640	33.37
No.4	-	4.75	-	120	19.8	19.5	0.00452	30.06
No.10	-	2	100.0	250	21	17	0.00313	25.85
No.20	0.01	0.85	100.0	388	22.1	14.5	0.00252	21.60
No.40	0.03	0.425	99.9	1283	21.9	13	0.00140	18.69
No.60	0.18	0.25	99.7					
No.100	0.39	0.15	99.3					
No.140	0.78	0.106	98.5					
No.200	1.80	0.075	96.6					



Gravel (%): 0.0
 Sand (%): 3.4
 Fines (%): 96.6

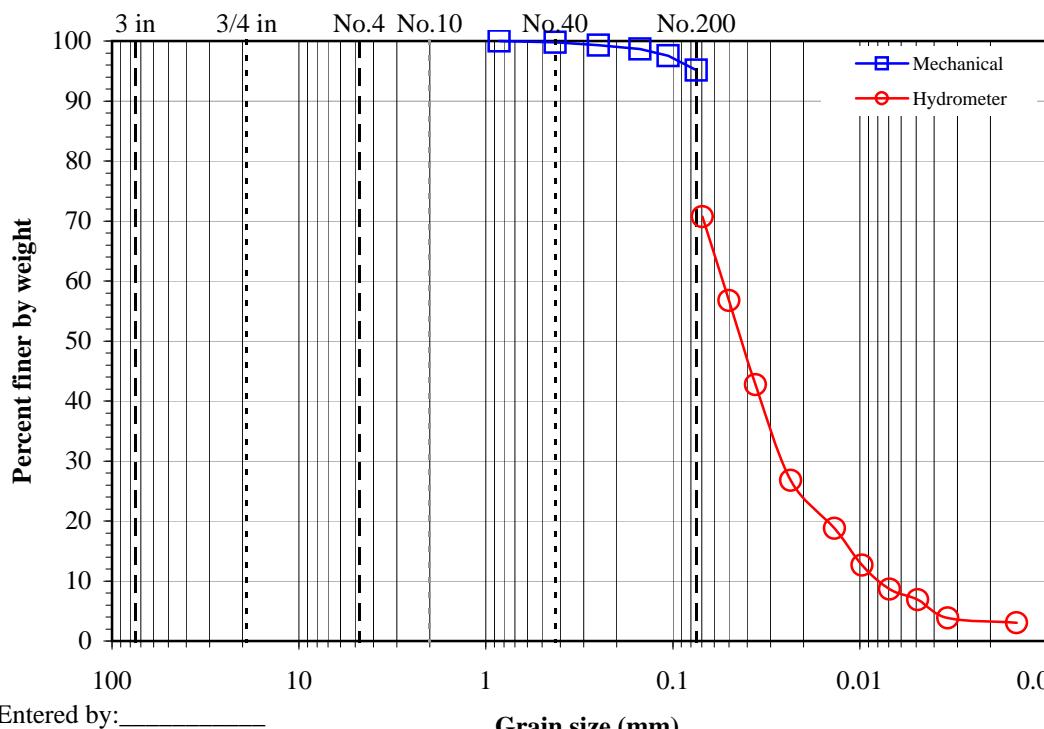
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Particle-Size Analysis of Soils with hydrometer

(ASTM D4221)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP001-01****Sample:****Depth: 1-10'****Description: Brown silty clay**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	-	92.41	92.41	
Split sieve:	#10			Dry soil + tare (g):	-	90.93	90.93	
		Moist	Dry	Tare (g):	-	37.69	37.69	
Total sample wt. (g):	25.70	25.00		Water content (%):	0.00	2.78	2.78	
+#10 Coarse fraction (g):		0.00		Hydrometer data		Slope: -0.1641		
-#10 Split fraction (g):	25.70	25.00		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	25.70	25.00		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Vacuum period (min):	10	Dispersion device:	None	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	21.8	17	0.06941	70.74
6"	-	150	-	1	21.8	13.5	0.05011	56.74
4"	-	100	-	2	21.8	10	0.03615	42.74
3"	-	75	-	5	21.8	6	0.02337	26.75
1.5"	-	37.5	-	15	21.8	4	0.01364	18.75
3/4"	-	19	-	30	21.7	2.5	0.00973	12.62
3/8"	-	9.5	-	60	21.7	1.5	0.00692	8.62
No.4	-	4.75	-	120	21.9	1	0.00489	6.89
No.10	-	2	-	250	22.6	0	0.00338	3.82
No.20	-	0.85	100.0	1377	22	0	0.00145	3.02
No.40	0.06	0.425	99.8					
No.60	0.17	0.25	99.3					
No.100	0.34	0.15	98.6					
No.140	0.62	0.106	97.5					
No.200	1.21	0.075	95.2					

Entered by: _____
Reviewed: _____

Dispersive Characteristics of Clay Soil by Double Hydrometer

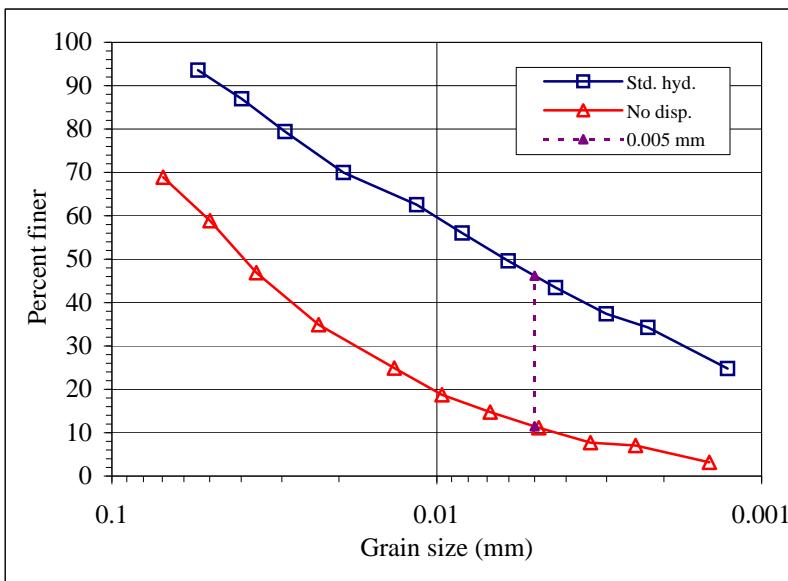
(ASTM D 4221)



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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP002-01**Sample:****Depth:** 1-10'**Description:** Brown clay

		Percent passing 5 um (ASTM D 4221) = 11.46	
		Percent passing 5 um (ASTM D 422) = 46.20	
		Percent Dispersion = 24.8	
Standard Hyd. (ASTM D 422) I J		Double Hyd. (ASTM D 4221) I J	
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0543	93.6	0.0695	68.9
0.0399	87.0	0.0499	58.9
0.0293	79.4	0.0359	46.9
0.0194	70.0	0.0231	34.9
0.0115	62.5	0.0135	24.9
0.0084	56.0	0.0096	18.8
0.0060	49.6	0.0069	14.8
0.0043	43.5	0.0049	11.2
0.0030	37.4	0.0034	7.7
0.0022	34.3	0.0024	7.0
0.0013	24.8	0.0014	3.2



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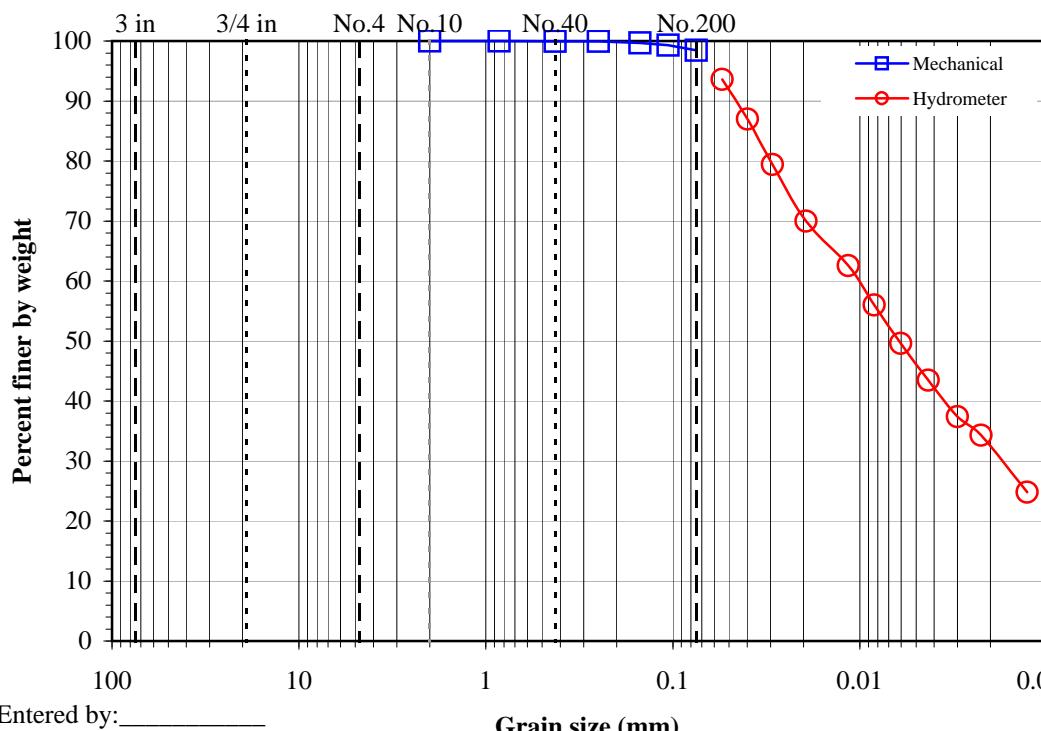
Reviewed:_____

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP002-01****Sample:****Depth: 1-10'****Description: Brown clay**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	-	72.43	72.43	
Split sieve:	#10			Dry soil + tare (g):	-	71.25	71.25	
		Moist	Dry	Tare (g):	-	37.74	37.74	
Total sample wt. (g):	54.81	52.95		Water content (%):	0.00	3.52	3.52	
+#10 Coarse fraction (g):		0.00		Hydrometer data		Slope: -0.1641		
-#10 Split fraction (g):	54.81	52.95		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	54.81	52.95		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Dispersion period (min):	15	Dispersion device:	Air-jet	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	17.9	53.5	0.05434	93.59
6"	-	150	-	1	17.9	50	0.03986	86.98
4"	-	100	-	2	17.9	46	0.02931	79.42
3"	-	75	-	5	17.9	41	0.01938	69.98
1.5"	-	37.5	-	15	18.2	37	0.01153	62.55
3/4"	-	19	-	30	18.4	33.5	0.00836	56.02
3/8"	-	9.5	-	60	18.9	30	0.00603	49.62
No.4	-	4.75	-	120	20	26.5	0.00431	43.46
No.10	-	2	100.0	250	21.3	23	0.00301	37.39
No.20	0.01	0.85	100.0	445	22.9	21	0.00224	34.27
No.40	0.02	0.425	100.0	1469	22.8	16	0.00127	24.79
No.60	0.04	0.25	99.9					
No.100	0.17	0.15	99.7					
No.140	0.38	0.106	99.3					
No.200	0.83	0.075	98.4					



Gravel (%): 0.0
 Sand (%): 1.6
 Fines (%): 98.4

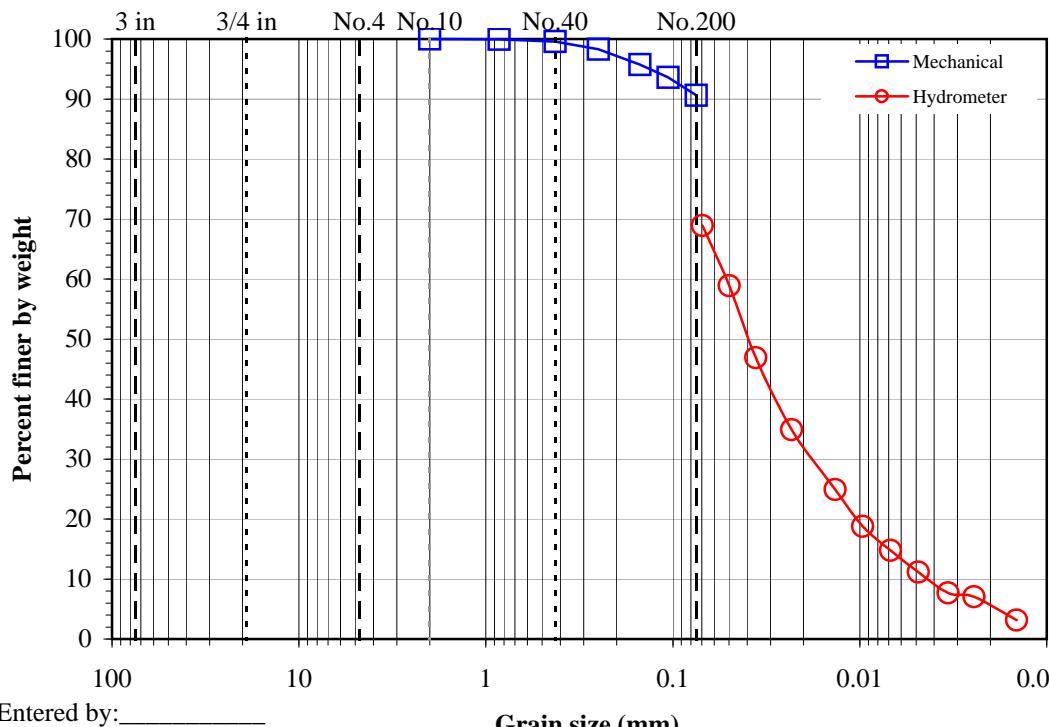
Entered by: _____
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Particle-Size Analysis of Soils with hydrometer

(ASTM D4221)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP002-01****Sample:****Depth: 1-10'****Description: Brown clay**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	-	72.43	72.43	
Split sieve:	#10			Dry soil + tare (g):	-	71.25	71.25	
		Moist	Dry	Tare (g):	-	37.74	37.74	
Total sample wt. (g):	25.88	25.00		Water content (%):	0.00	3.52	3.52	
+#10 Coarse fraction (g):		0.00		<u>Hydrometer data</u>		Slope: -0.1641		
-#10 Split fraction (g):	25.88	25.00		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	25.88	25.00		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Vacuum period (min):	10	Dispersion device:	None	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	21.9	16.5	0.06955	68.89
6"	-	150	-	1	21.9	14	0.04991	58.89
4"	-	100	-	2	21.9	11	0.03591	46.89
3"	-	75	-	5	21.9	8	0.02309	34.89
1.5"	-	37.5	-	15	21.9	5.5	0.01351	24.89
3/4"	-	19	-	30	21.8	4	0.00964	18.75
3/8"	-	9.5	-	60	21.8	3	0.00685	14.75
No.4	-	4.75	-	120	22.1	2	0.00485	11.15
No.10	-	2	100.0	250	22.5	1	0.00336	7.69
No.20	0.01	0.85	100.0	465	23.5	0.5	0.00244	7.03
No.40	0.10	0.425	99.6	1375	22.1	0	0.00145	3.15
No.60	0.43	0.25	98.3					
No.100	1.06	0.15	95.8					
No.140	1.60	0.106	93.6					
No.200	2.34	0.075	90.6					

Entered by: _____
Reviewed: _____

Dispersive Characteristics of Clay Soil by Double Hydrometer

(ASTM D 4221)

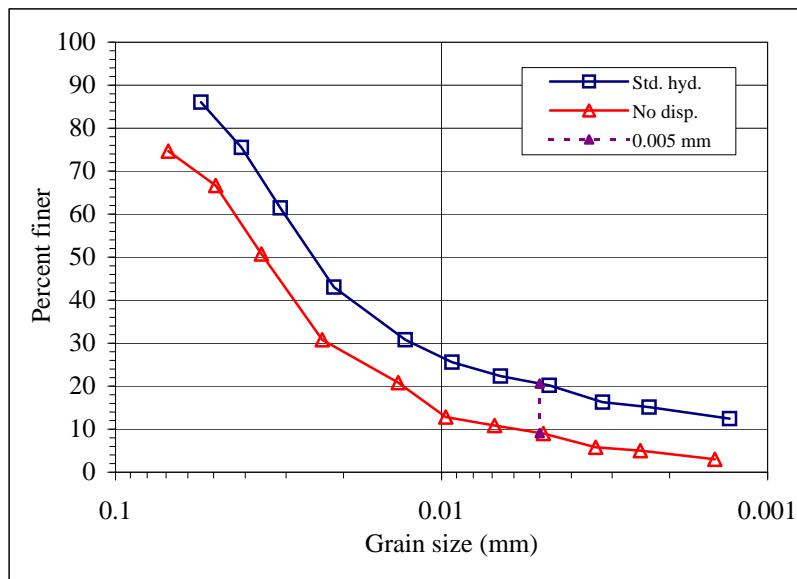


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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP003-01**Sample:****Depth:** 1-10'**Description:** Brown silty clay

Percent passing 5 um (ASTM D 4221) =	9.13
Percent passing 5 um (ASTM D 422) =	20.62
Percent Dispersion =	44.3

Standard Hyd. (ASTM D 422)		Double Hyd. (ASTM D 4221)	
I	J	I	J
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0547	86.0	0.0689	74.7
0.0411	75.5	0.0493	66.7
0.0312	61.5	0.0357	50.7
0.0214	43.0	0.0232	30.8
0.0129	30.8	0.0136	20.8
0.0093	25.6	0.0097	12.8
0.0066	22.4	0.0069	10.9
0.0047	20.2	0.0049	9.0
0.0032	16.3	0.0034	5.8
0.0023	15.1	0.0025	5.0
0.0013	12.5	0.0015	3.0



Entered by: _____

Reviewed: _____

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

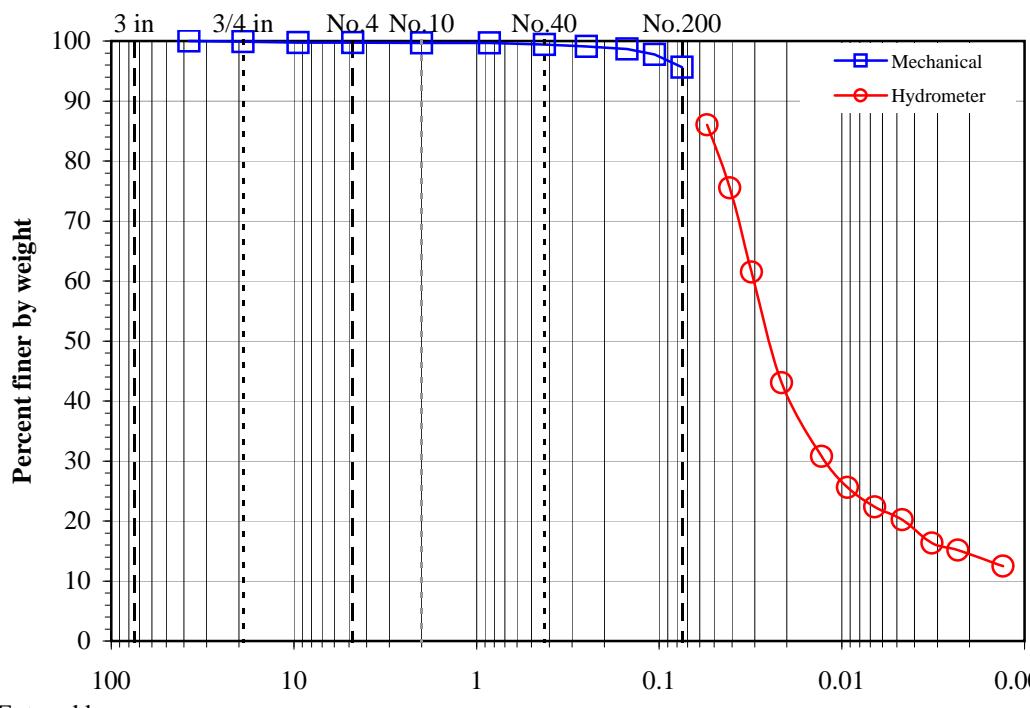
Date: 11/18/2013

By: BRR

Boring No.: WUA-TP003-01**Sample:****Depth: 1-10'**

Description: Brown silty clay

				Water content data	C.F.(+3/8")	S.F.(-3/8")	Hyd.(+No.10)	Hyd.(-No.10)
Split sieve:	Yes			Moist soil + tare (g):	178.88	626.37	37.82	72.08
Split sieve:	3/8"			Dry soil + tare (g):	178.66	597.15	37.82	71.58
		Moist	Dry	Tare (g):	127.16	127.12	37.77	37.47
Total sample wt. (g):	18843.42	17743.34		Water content (%):	0.43	6.22	0.00	1.47
+3/8" Coarse fraction (g):	51.32	51.10		<u>Hydrometer data</u>				
-3/8" Split fraction (g):	463.00	463.00		Hyd. split:	No.10		Slope:	-0.1641
Hydrometer fraction (g):	57.65	56.82		Gs:	2.65	Assumed	Intercept:	16.3
Split fraction:	0.997			Bulb No.	2		α :	1.00
				Dispersion period (min):	15		Hyd. fraction:	99.70
							Dispersion device:	Air-jet
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	17.8	53	0.05471	86.04
6"	-	150	-	1	17.8	47	0.04111	75.51
4"	-	100	-	2	17.8	39	0.03122	61.47
3"	-	75	-	5	17.8	28.5	0.02139	43.04
1.5"	-	37.5	100.0	15	17.9	21.5	0.01293	30.80
3/4"	21.15	19	99.9	30	18.1	18.5	0.00929	25.61
3/8"	51.10	9.5	99.7	<=Split	60	18.8	16.5	0.00660
No.4	-	4.75	99.7		118	20	15	0.00467
No.10	0.05	2	99.7	<=Split hyd.	250	21.3	12.5	0.00321
No.20	0.02	0.85	99.7		470	22.8	11.5	0.00231
No.40	0.15	0.425	99.4		1494	22.7	10	0.00131
No.60	0.34	0.25	99.1					
No.100	0.60	0.15	98.6					
No.140	1.12	0.106	97.7					
No.200	2.32	0.075	95.6					



Entered by: _____

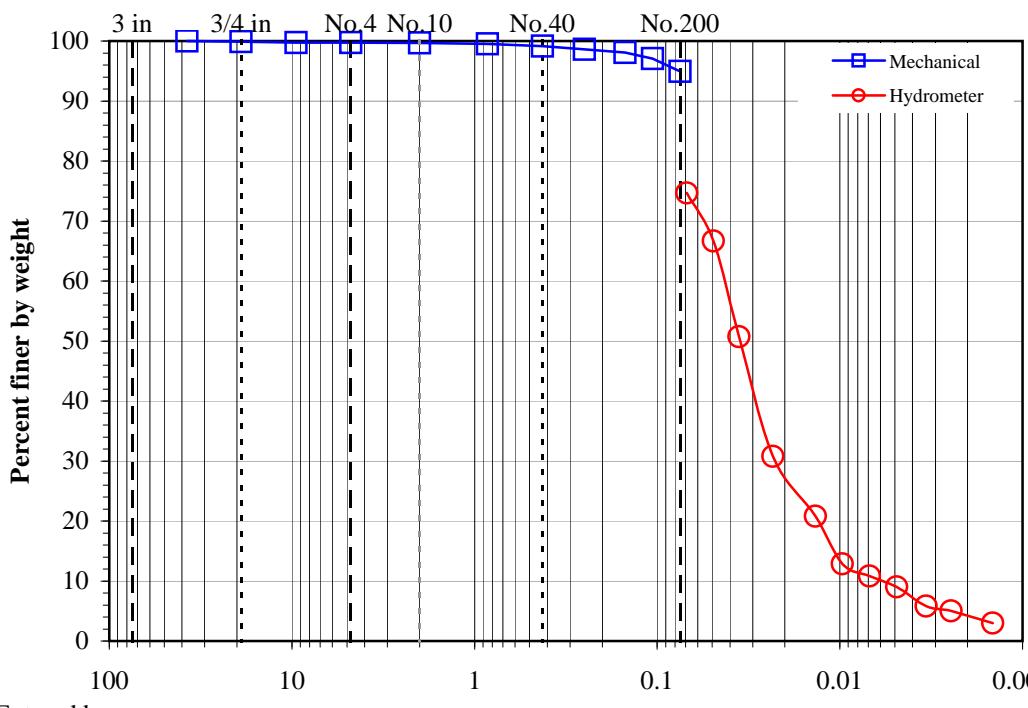
Reviewed: _____

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP003-01****Sample:****Depth: 1-10'****Description: Brown silty clay**

				Water content data	C.F.(+3/8")	S.F.(-3/8")	Hyd.(+No.10)	Hyd.(-No.10)
Split sieve:	Yes			Moist soil + tare (g):	178.88	626.37	37.82	72.08
Split sieve:	3/8"			Dry soil + tare (g):	178.66	597.15	37.82	71.58
		Moist	Dry	Tare (g):	127.16	127.12	37.77	37.47
Total sample wt. (g):	18843.42	17743.34		Water content (%):	0.43	6.22	0.00	1.47
+3/8" Coarse fraction (g):	51.32	51.10		<u>Hydrometer data</u>				
-3/8" Split fraction (g):	463.00	463.00		Hyd. split:	No.10		Slope:	-0.1641
Hydrometer fraction (g):	25.37	25.00		Gs:	2.65	Assumed	Intercept:	16.3
Split fraction:	0.997			Bulb No.	2		α :	1.00
				Vacuum period (min):	10		Hyd. fraction:	99.70
							Dispersion device:	None
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	21.9	18	0.06891	74.65
6"	-	150	-	1	21.9	16	0.04933	66.68
4"	-	100	-	2	21.9	12	0.03571	50.73
3"	-	75	-	5	21.9	7	0.02322	30.79
1.5"	-	37.5	100.0	15	21.9	4.5	0.01359	20.82
3/4"	21.15	19	99.9	30	21.9	2.5	0.00971	12.85
3/8"	51.10	9.5	99.7	<=Split	60	21.9	2	0.00688
No.4	-	4.75	99.7		120	22	1.5	0.00487
No.10	0.05	2	99.7	<=Split hyd.	250	22.6	0.5	0.00337
No.20	0.04	0.85	99.5		462	23.5	0	0.00246
No.40	0.14	0.425	99.1		1372	22	0	0.00145
No.60	0.27	0.25	98.6					
No.100	0.40	0.15	98.1					
No.140	0.66	0.106	97.1					
No.200	1.19	0.075	95.0					



Entered by: _____

Reviewed: _____

Gravel (%): 0.3
Sand (%): 4.8
Fines (%): 95.0

Comments:
 Vacuum applied and no flocculating agent used.

Dispersive Characteristics of Clay Soil by Double Hydrometer

(ASTM D 4221)

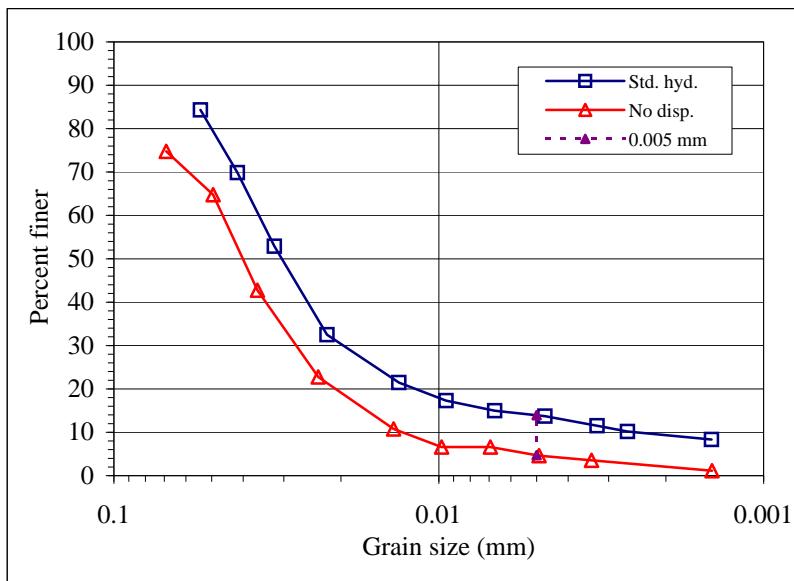


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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP004-01**Sample:****Depth:** 1-10'**Description:** Brown silt

Percent passing 5 um (ASTM D 4221) =	4.72
Percent passing 5 um (ASTM D 422) =	13.93
Percent Dispersion =	33.9

Standard Hyd. (ASTM D 422)		Double Hyd. (ASTM D 4221)	
I	J	I	J
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0541	84.3	0.0690	74.8
0.0417	69.9	0.0495	64.8
0.0321	52.9	0.0361	42.8
0.0221	32.5	0.0235	22.8
0.0133	21.5	0.0138	10.8
0.0095	17.3	0.0098	6.6
0.0067	15.0	0.0069	6.6
0.0047	13.7	0.0049	4.6
0.0033	11.5	0.0034	3.6
0.0026	10.2	0.0014	1.1
0.0014	8.3		

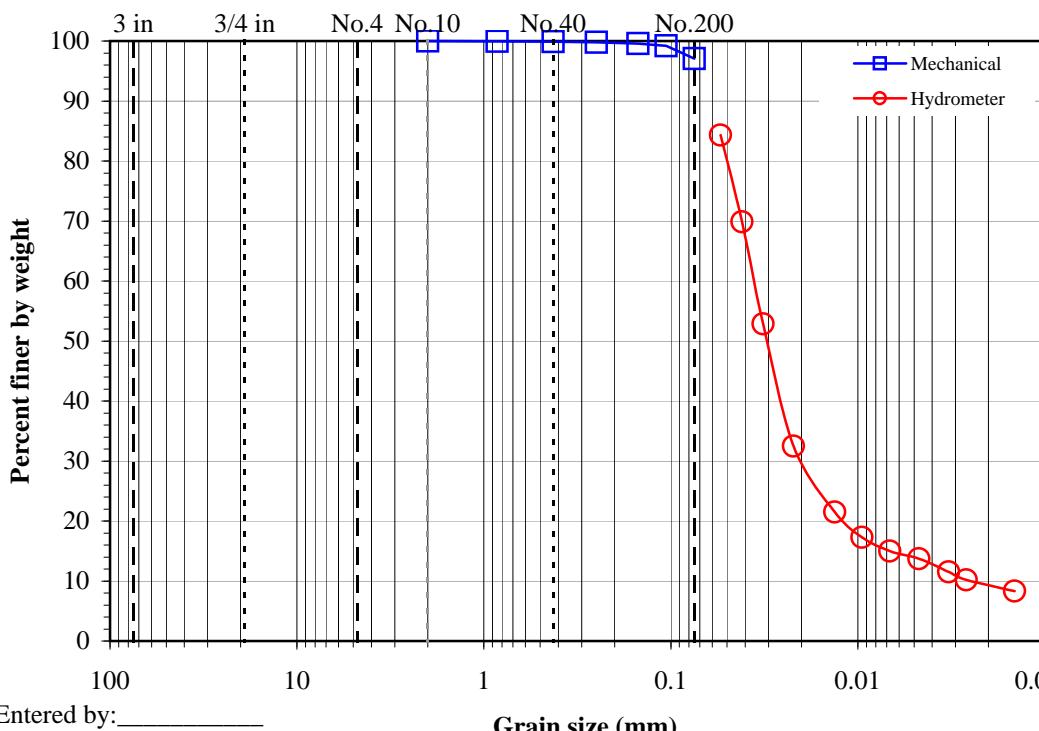
Entered by: _____
Reviewed: _____

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP004-01****Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	-	48.39	48.39	
Split sieve:	#10			Dry soil + tare (g):	-	48.28	48.28	
		Moist	Dry	Tare (g):	-	37.39	37.39	
Total sample wt. (g):	59.44	58.85		Water content (%):	0.00	1.01	1.01	
+#10 Coarse fraction (g):		0.00		Hydrometer data		Slope: -0.1641		
-#10 Split fraction (g):	59.44	58.85		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	59.44	58.85		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Dispersion period (min):	15	Dispersion device:	Air-jet	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	18.2	53.5	0.05413	84.32
6"	-	150	-	1	18.2	45	0.04167	69.87
4"	-	100	-	2	18.2	35	0.03207	52.88
3"	-	75	-	5	18.2	23	0.02209	32.49
1.5"	-	37.5	-	15	18.3	16.5	0.01327	21.48
3/4"	-	19	-	30	18.5	14	0.00950	17.30
3/8"	-	9.5	-	60	19.1	12.5	0.00673	14.98
No.4	-	4.75	-	120	20.3	11.5	0.00471	13.73
No.10	-	2	100.0	<=Split	250	21.2	10	0.00326
No.20	0.02	0.85	100.0		380	22.2	9	0.00262
No.40	0.05	0.425	99.9		1275	21.8	8	0.00145
No.60	0.13	0.25	99.8					
No.100	0.24	0.15	99.6					
No.140	0.48	0.106	99.2					
No.200	1.73	0.075	97.1					



Gravel (%): 0.0
 Sand (%): 2.9
 Fines (%): 97.1

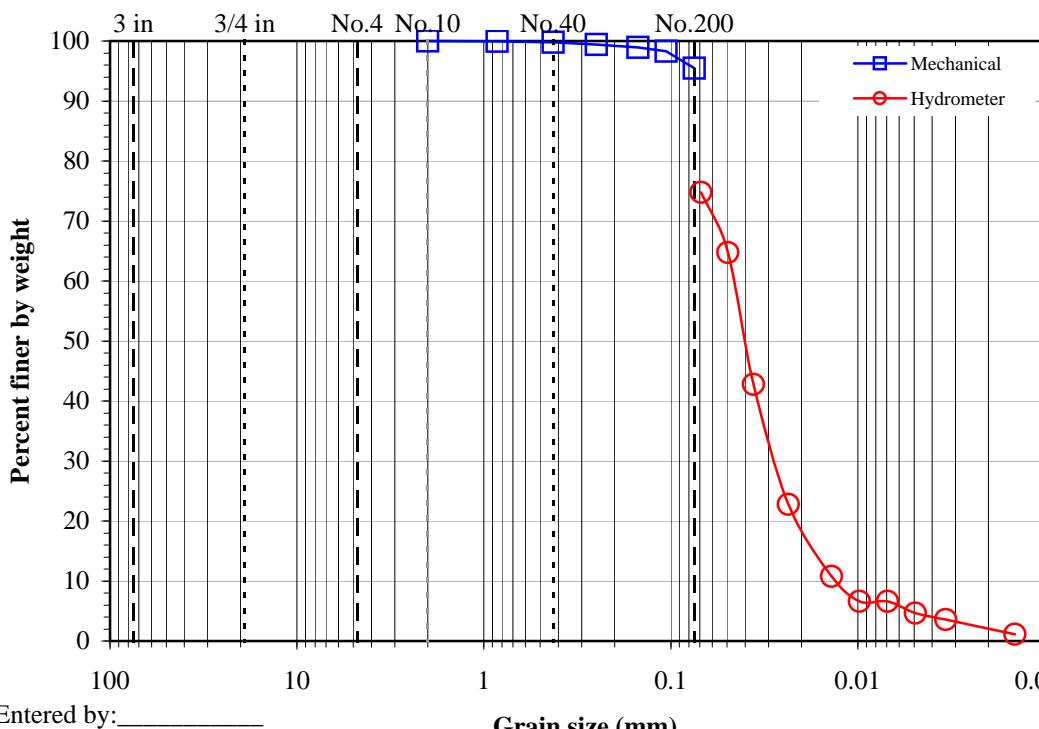
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Particle-Size Analysis of Soils with hydrometer

(ASTM D4221)

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Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP004-01****Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	-	48.39	48.39	
Split sieve:	#10			Dry soil + tare (g):	-	48.28	48.28	
		Moist	Dry	Tare (g):	-	37.39	37.39	
Total sample wt. (g):	25.25	25.00		Water content (%):	0.00	1.01	1.01	
+#10 Coarse fraction (g):		0.00		<u>Hydrometer data</u>		Slope: -0.1641		
-#10 Split fraction (g):	25.25	25.00		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	25.25	25.00		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Vacuum period (min):	10	Dispersion device:	None	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	21.8	18	0.06899	74.76
6"	-	150	-	1	21.8	15.5	0.04952	64.76
4"	-	100	-	2	21.8	10	0.03615	42.76
3"	-	75	-	5	21.8	5	0.02349	22.75
1.5"	-	37.5	-	15	21.8	2	0.01378	10.75
3/4"	-	19	-	30	21.7	1	0.00981	6.62
3/8"	-	9.5	-	60	21.7	1	0.00694	6.62
No.4	-	4.75	-	120	21.7	0.5	0.00492	4.62
No.10	-	2	100.0	250	22.4	0	0.00339	3.56
No.20	0.01	0.85	100.0	1440	20.6	0	0.00144	1.14
No.40	0.05	0.425	99.8					
No.60	0.14	0.25	99.4					
No.100	0.27	0.15	98.9					
No.140	0.43	0.106	98.3					
No.200	1.13	0.075	95.5					

Entered by: _____
Reviewed: _____

Dispersive Characteristics of Clay Soil by Double Hydrometer

(ASTM D 4221)

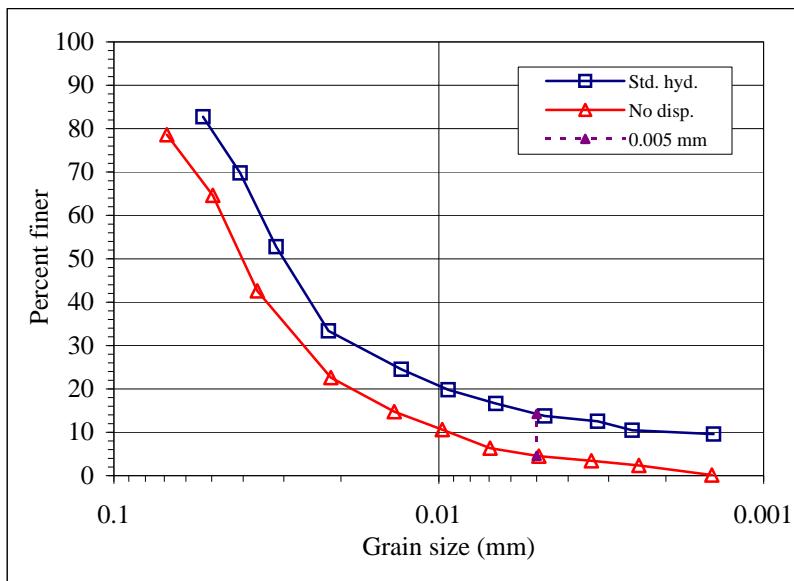


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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP005-01**Sample:****Depth:** 1-10'**Description:** Brown silt

Percent passing 5 um (ASTM D 4221) =	4.57
Percent passing 5 um (ASTM D 422) =	14.25
Percent Dispersion =	32.1

Standard Hyd. (ASTM D 422)		Double Hyd. (ASTM D 4221)	
I	J	I	J
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0532	82.7	0.0687	78.6
0.0409	69.8	0.0496	64.6
0.0317	52.8	0.0362	42.6
0.0219	33.4	0.0215	22.6
0.0131	24.5	0.0137	14.8
0.0094	19.8	0.0098	10.6
0.0067	16.7	0.0069	6.4
0.0047	13.8	0.0049	4.5
0.0032	12.5	0.0034	3.4
0.0025	10.5	0.0024	2.4
0.0014	9.6	0.0014	0.1

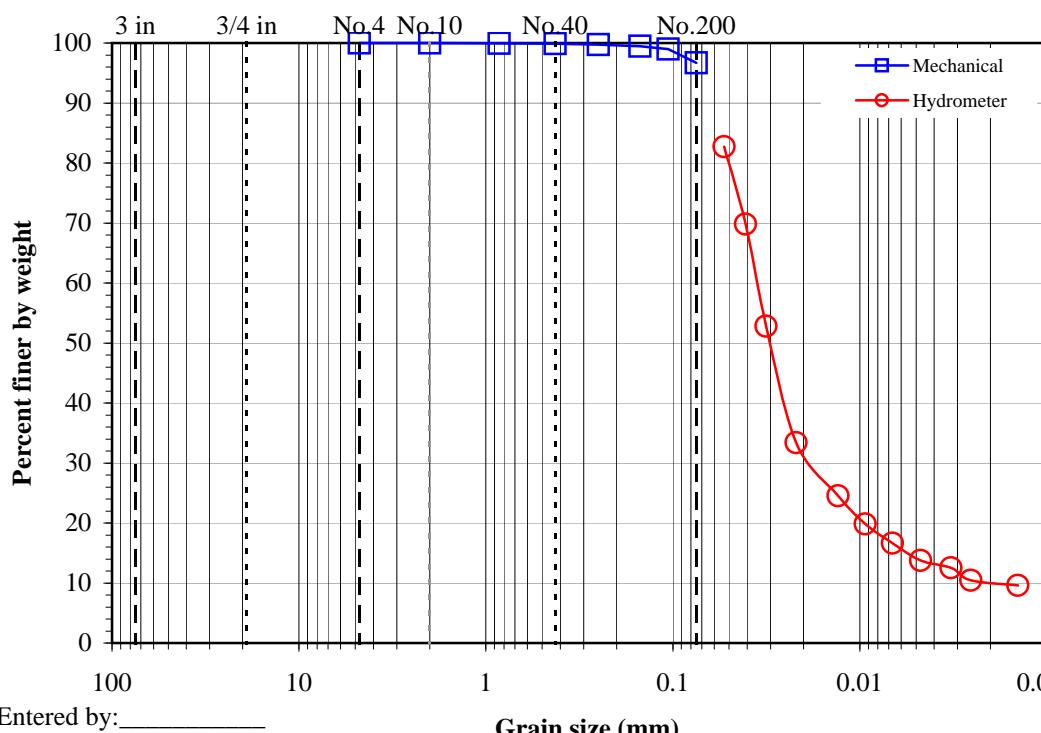
Entered by: _____
Reviewed: _____

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP005-01****Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	37.86	120.67	120.67	
Split sieve:	#10			Dry soil + tare (g):	37.86	119.56	119.56	
		Moist	Dry	Tare (g):	37.84	37.75	37.75	
Total sample wt. (g):	563.63	556.09		Water content (%):	0.00	1.36	1.36	
+#10 Coarse fraction (g):	0.01	0.01		Hydrometer data		Slope: -0.1641		
-#10 Split fraction (g):	62.65	61.81		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	62.65	61.81		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction: 100.00		
				Dispersion period (min):	15	Dispersion device:	Air-jet	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	18.3	55	0.05319	82.73
6"	-	150	-	1	18.3	47	0.04086	69.79
4"	-	100	-	2	18.3	36.5	0.03166	52.80
3"	-	75	-	5	18.3	24.5	0.02185	33.39
1.5"	-	37.5	-	15	18.4	19	0.01305	24.53
3/4"	-	19	-	30	18.8	16	0.00936	19.82
3/8"	-	9.5	-	60	19	14	0.00668	16.65
No.4	-	4.75	100.0	120	20	12	0.00472	13.77
No.10	0.01	2	100.0	250	21.1	11	0.00324	12.54
No.20	0.03	0.85	99.9	404	22.1	9.5	0.00254	10.47
No.40	0.08	0.425	99.9	1297	21.9	9	0.00143	9.59
No.60	0.17	0.25	99.7					
No.100	0.32	0.15	99.5					
No.140	0.61	0.106	99.0					
No.200	2.03	0.075	96.7					



Gravel (%): 0.0
 Sand (%): 3.3
 Fines (%): 96.7

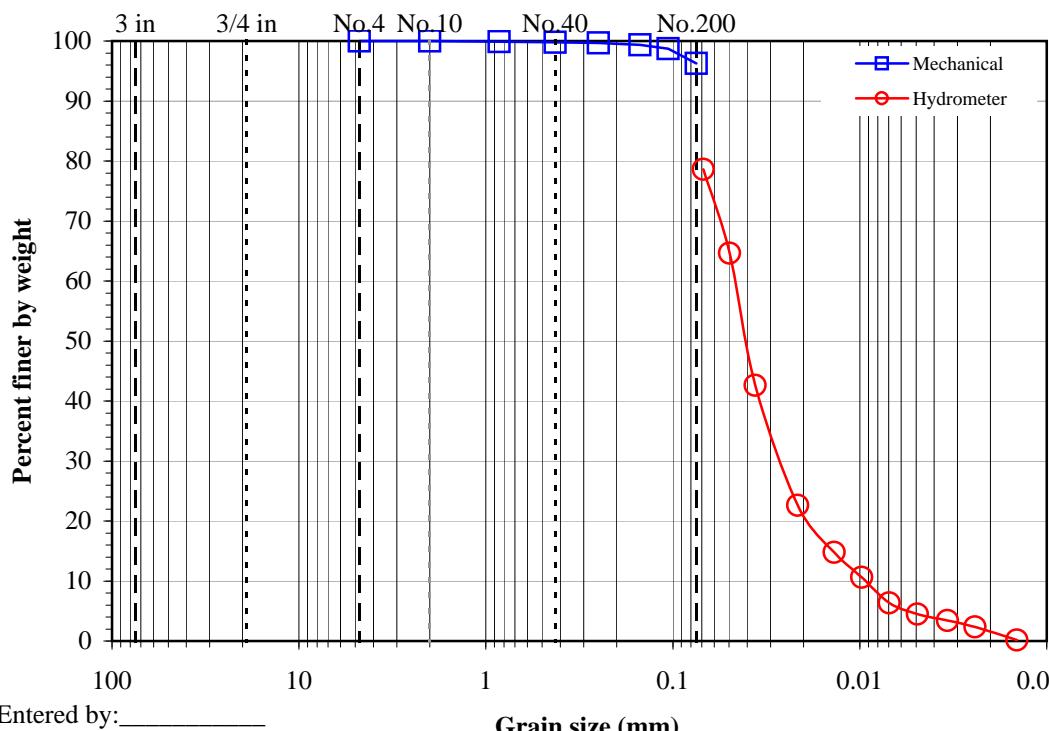
Entered by: _____
 Reviewed: _____

Particle-Size Analysis of Soils with hydrometer

(ASTM D4221)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP005-01****Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	37.86	120.67	120.67	
Split sieve:	#10			Dry soil + tare (g):	37.86	119.56	119.56	
		Moist	Dry	Tare (g):	37.84	37.75	37.75	
Total sample wt. (g):	563.63	556.09		Water content (%):	0.00	1.36	1.36	
+#10 Coarse fraction (g):	0.01	0.01		Hydrometer data		Slope:	-0.1641	
-#10 Split fraction (g):	25.34	25.00		Hyd. split:	No.10	Intercept:	16.3	
Hydrometer fraction (g):	25.34	25.00		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Vacuum period (min):	10	Dispersion device:	None	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	21.7	19	0.06867	78.61
6"	-	150	-	1	21.7	15.5	0.04960	64.62
4"	-	100	-	2	21.7	10	0.03621	42.62
3"	-	75	-	6	21.7	5	0.02148	22.62
1.5"	-	37.5	-	15	21.8	3	0.01371	14.75
3/4"	-	19	-	30	21.7	2	0.00976	10.62
3/8"	-	9.5	-	60	21.5	1	0.00695	6.35
No.4	-	4.75	100.0	120	21.6	0.5	0.00492	4.48
No.10	0.01	2	100.0	250	22.3	0	0.00339	3.42
No.20	0.02	0.85	99.9	484	23	-0.5	0.00242	2.36
No.40	0.05	0.425	99.8	1440	20.6	-0.25	0.00144	0.14
No.60	0.08	0.25	99.7					
No.100	0.16	0.15	99.4					
No.140	0.32	0.106	98.7					
No.200	0.93	0.075	96.3					

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Dispersive Characteristics of Clay Soil by Double Hydrometer

(ASTM D 4221)

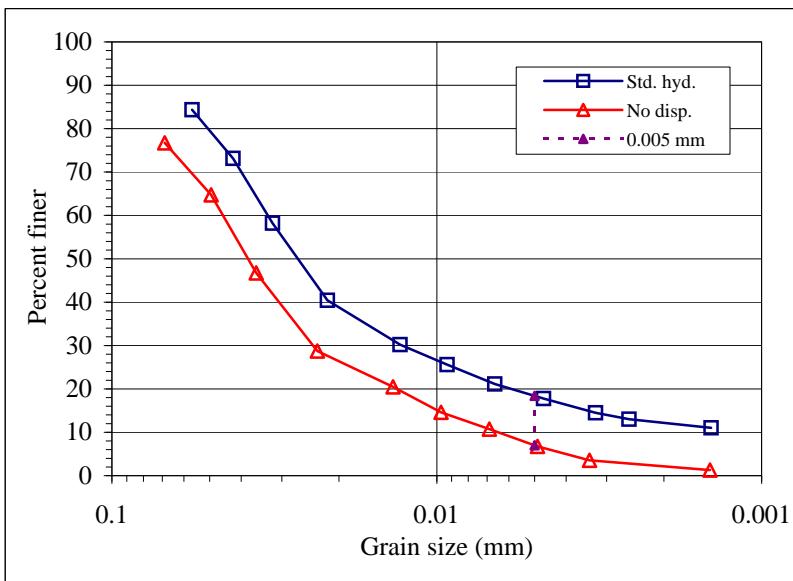


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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP006-01**Sample:****Depth:** 1-10'**Description:** Brown silty clay

Percent passing 5 um (ASTM D 4221) =	7.00
Percent passing 5 um (ASTM D 422) =	18.40
Percent Dispersion =	38.0

Standard Hyd. (ASTM D 422)		Double Hyd. (ASTM D 4221)	
I	J	I	J
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0567	84.4	0.0688	76.7
0.0424	73.2	0.0495	64.7
0.0320	58.2	0.0359	46.7
0.0217	40.4	0.0233	28.7
0.0130	30.2	0.0136	20.5
0.0093	25.6	0.0097	14.6
0.0066	21.1	0.0069	10.8
0.0047	17.8	0.0049	6.8
0.0032	14.5	0.0034	3.6
0.0026	13.0	0.0014	1.3
0.0014	11.0		

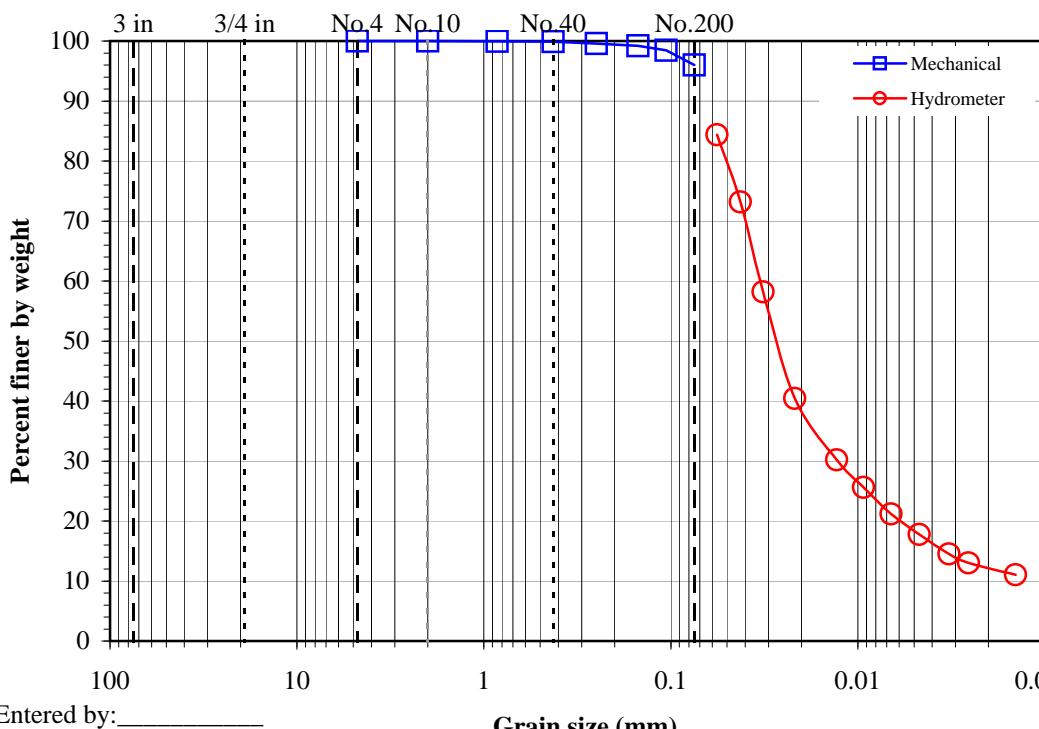
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Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP006-01****Sample:****Depth: 1-10'****Description: Brown silty clay**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.-No.10)
Split sieve:	Yes			Moist soil + tare (g):	37.60	102.43	102.43
Split sieve:	#10			Dry soil + tare (g):	37.60	99.79	99.79
		Moist	Dry	Tare (g):	37.57	37.31	37.31
Total sample wt. (g):	575.27	551.95		Water content (%):	0.00	4.23	4.23
+#10 Coarse fraction (g):	0.01	0.01		Hydrometer data		Slope: -0.1641	
-#10 Split fraction (g):	55.76	53.50		Hyd. split:	No.10	Intercept: 16.3	
Hydrometer fraction (g):	55.76	53.50		Gs:	2.65 Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction: 100.00	
				Dispersion period (min):	15	Dispersion device: Air-jet	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm) % Soil in Suspension
8"	-	200	-	0.5	18.3	49	0.05667 84.37
6"	-	150	-	1	18.3	43	0.04239 73.16
4"	-	100	-	2	18.3	35	0.03204 58.20
3"	-	75	-	5	18.3	25.5	0.02171 40.45
1.5"	-	37.5	-	15	18.4	20	0.01297 30.21
3/4"	-	19	-	30	18.6	17.5	0.00929 25.62
3/8"	-	9.5	-	60	19.1	15	0.00663 21.15
No.4	-	4.75	100.0	120	20	13	0.00469 17.78
No.10	0.01	2	100.0	250	21.1	11	0.00324 14.49
No.20	0.02	0.85	100.0	396	22.1	10	0.00256 13.03
No.40	0.06	0.425	99.9	1290	21.8	9	0.00143 11.04
No.60	0.22	0.25	99.6				
No.100	0.44	0.15	99.2				
No.140	0.82	0.106	98.5				
No.200	2.13	0.075	96.0				



Gravel (%): 0.0
 Sand (%): 4.0
 Fines (%): 96.0

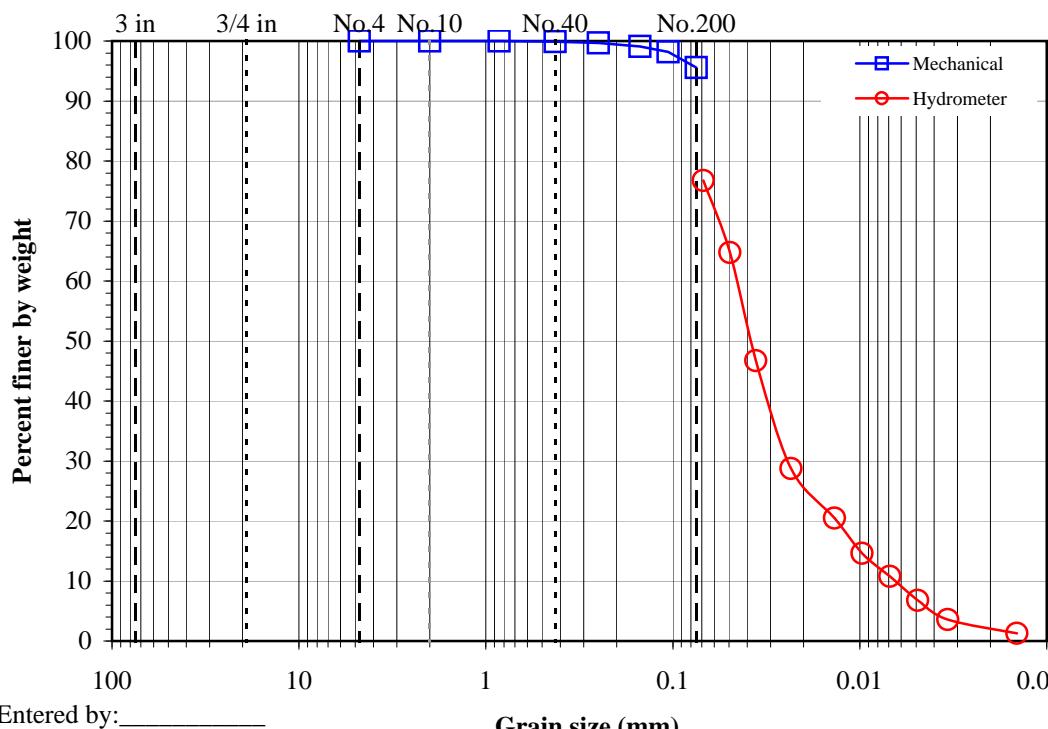
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Particle-Size Analysis of Soils with hydrometer

(ASTM D4221)

**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP006-01****Sample:****Depth: 1-10'****Description: Brown silty clay**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	37.60	102.43	102.43	
Split sieve:	#10			Dry soil + tare (g):	37.60	99.79	99.79	
		Moist	Dry	Tare (g):	37.57	37.31	37.31	
Total sample wt. (g):	575.27	551.95		Water content (%):	0.00	4.23	4.23	
+#10 Coarse fraction (g):	0.01	0.01		Hydrometer data		Slope: -0.1641		
-#10 Split fraction (g):	26.06	25.00		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	26.06	25.00		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Vacuum period (min):	10	Dispersion device:	None	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	21.8	18.5	0.06877	76.74
6"	-	150	-	1	21.8	15.5	0.04952	64.74
4"	-	100	-	2	21.8	11	0.03595	46.75
3"	-	75	-	5	21.8	6.5	0.02331	28.75
1.5"	-	37.5	-	15	21.6	4.5	0.01364	20.48
3/4"	-	19	-	30	21.7	3	0.00971	14.62
3/8"	-	9.5	-	60	21.8	2	0.00689	10.75
No.4	-	4.75	100.0	120	21.8	1	0.00490	6.75
No.10	0.01	2	100.0	250	22.4	0	0.00339	3.56
No.20	-	0.85	100.0	1436	20.7	0	0.00144	1.28
No.40	0.02	0.425	99.9					
No.60	0.08	0.25	99.7					
No.100	0.22	0.15	99.1					
No.140	0.45	0.106	98.2					
No.200	1.10	0.075	95.6					

Entered by: _____
Reviewed: _____

Dispersive Characteristics of Clay Soil by Double Hydrometer

(ASTM D 4221)

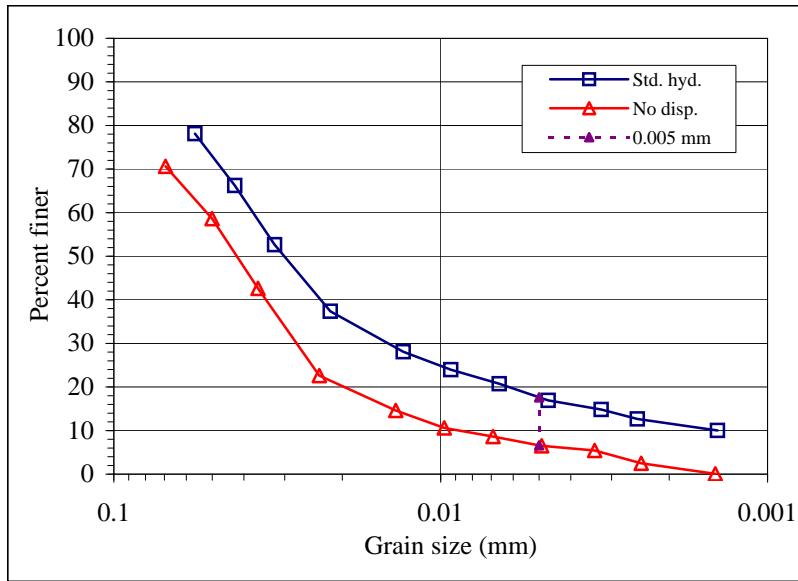


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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP007-01**Sample:****Depth:** 1-10'**Description:** Brown silt

Percent passing 5 um (ASTM D 4221) =	6.60
Percent passing 5 um (ASTM D 422) =	17.63
Percent Dispersion =	37.4

Standard Hyd. (ASTM D 422)		Double Hyd. (ASTM D 4221)	
I	J	I	J
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0565	78.1	0.0695	70.6
0.0427	66.2	0.0500	58.6
0.0322	52.7	0.0362	42.6
0.0218	37.4	0.0235	22.6
0.0130	28.1	0.0137	14.6
0.0093	24.0	0.0098	10.6
0.0066	20.7	0.0069	8.6
0.0047	16.9	0.0049	6.5
0.0032	14.8	0.0034	5.4
0.0025	12.7	0.0024	2.5
0.0014	10.0	0.0014	0.1

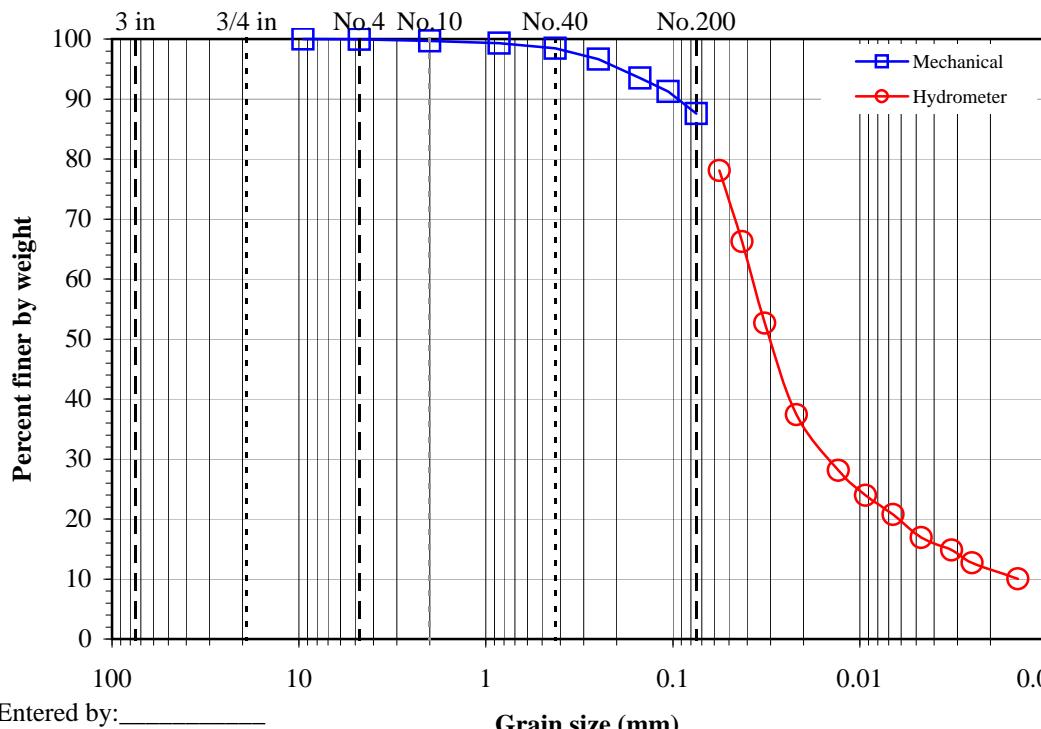
Entered by: _____
Reviewed: _____

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR**
 **IGES**
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Boring No.: WUA-TP007-01**Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	41.56	96.71	96.71	
Split sieve:	#10			Dry soil + tare (g):	41.53	95.71	95.71	
		Moist	Dry	Tare (g):	38.15	37.76	37.76	
Total sample wt. (g):	471.57	463.58		Water content (%):	0.89	1.73	1.73	
+#10 Coarse fraction (g):	1.38	1.37		Hydrometer data		Slope: -0.1641		
-#10 Split fraction (g):	59.77	58.76		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	59.77	58.76		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	0.997			Bulb No.	2	Hyd. fraction:	99.70	
				Dispersion period (min):	15	Dispersion device:	Air-jet	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	17.8	50	0.05645	78.11
6"	-	150	-	1	17.8	43	0.04266	66.23
4"	-	100	-	2	17.8	35	0.03223	52.65
3"	-	75	-	5	17.8	26	0.02177	37.38
1.5"	-	37.5	-	15	17.9	20.5	0.01301	28.09
3/4"	-	19	-	30	18.2	18	0.00931	23.95
3/8"	-	9.5	100.0	60	18.7	16	0.00662	20.75
No.4	0.25	4.75	99.9	120	19.8	13.5	0.00469	16.91
No.10	1.38	2	99.7	250	21	12	0.00323	14.81
No.20	0.23	0.85	99.3	412	22.1	10.5	0.00250	12.68
No.40	0.73	0.425	98.5	1305	21.8	9	0.00142	10.02
No.60	1.81	0.25	96.6					
No.100	3.65	0.15	93.5					
No.140	4.97	0.106	91.3					
No.200	7.16	0.075	87.6					


Gravel (%): 0.1
Sand (%): 12.4
Fines (%): 87.6

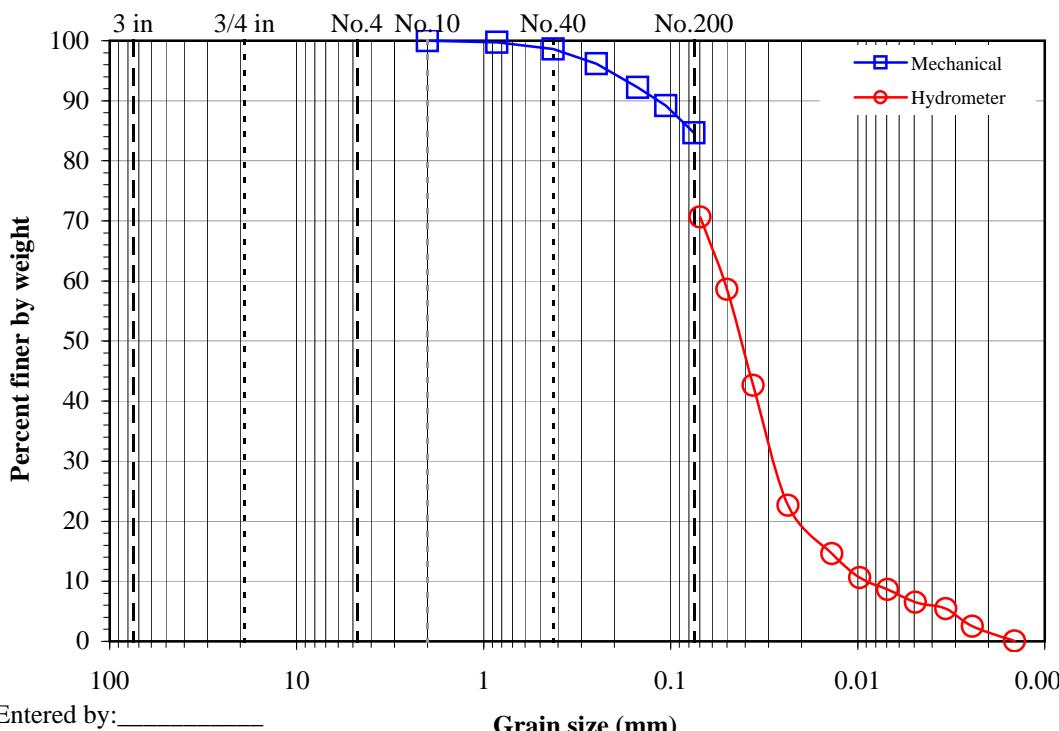
 Entered by: _____
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Particle-Size Analysis of Soils with hydrometer

(ASTM D4221)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR**
 **IGES**
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Boring No.: WUA-TP007-01**Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	-	96.71	96.71	
Split sieve:	#10			Dry soil + tare (g):	-	95.71	95.71	
		Moist	Dry	Tare (g):	-	37.76	37.76	
Total sample wt. (g):	25.43	25.00		Water content (%):	0.00	1.73	1.73	
+#10 Coarse fraction (g):		0.00		<u>Hydrometer data</u>		Slope: -0.1641		
-#10 Split fraction (g):	25.43	25.00		Hyd. split:	No.10	Intercept: 16.3		
Hydrometer fraction (g):	25.43	25.00		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Vacuum period (min):	10	Dispersion device:	None	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	21.7	17	0.06952	70.62
6"	-	150	-	1	21.7	14	0.05004	58.62
4"	-	100	-	2	21.7	10	0.03621	42.62
3"	-	75	-	5	21.7	5	0.02353	22.62
1.5"	-	37.5	-	15	21.7	3	0.01373	14.62
3/4"	-	19	-	30	21.7	2	0.00976	10.62
3/8"	-	9.5	-	60	21.7	1.5	0.00692	8.62
No.4	-	4.75	-	120	21.6	1	0.00491	6.49
No.10	-	2	100.0	<=Split	21.6	0.5	0.00338	5.42
No.20	0.07	0.85	99.7		22.3	-0.5	0.00244	2.50
No.40	0.35	0.425	98.6		23.1	-0.5	0.00145	0.08
No.60	0.96	0.25	96.2		20.7	-0.3		
No.100	1.94	0.15	92.2					
No.140	2.70	0.106	89.2					
No.200	3.84	0.075	84.6					

Entered by: _____
Reviewed: _____

Dispersive Characteristics of Clay Soil by Double Hydrometer

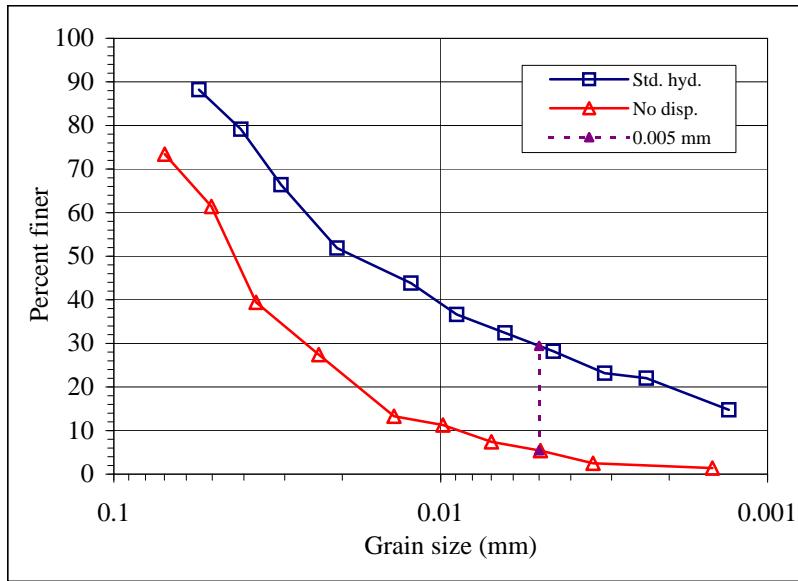
(ASTM D 4221)



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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP008-01**Sample:****Depth:** 1-10'**Description:** Brown silt

		Percent passing 5 um (ASTM D 4221) = 5.46	
		Percent passing 5 um (ASTM D 422) = 29.43	
		Percent Dispersion = 18.6	
Standard Hyd. (ASTM D 422) I J		Double Hyd. (ASTM D 4221) I J	
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0549	88.2	0.0698	73.4
0.0409	79.1	0.0503	61.4
0.0308	66.4	0.0367	39.4
0.0207	51.9	0.0236	27.4
0.0123	43.8	0.0139	13.3
0.0089	36.6	0.0098	11.3
0.0064	32.4	0.0070	7.4
0.0045	28.2	0.0050	5.4
0.0032	23.2	0.0034	2.5
0.0024	22.0	0.0015	1.4
0.0013	14.8		

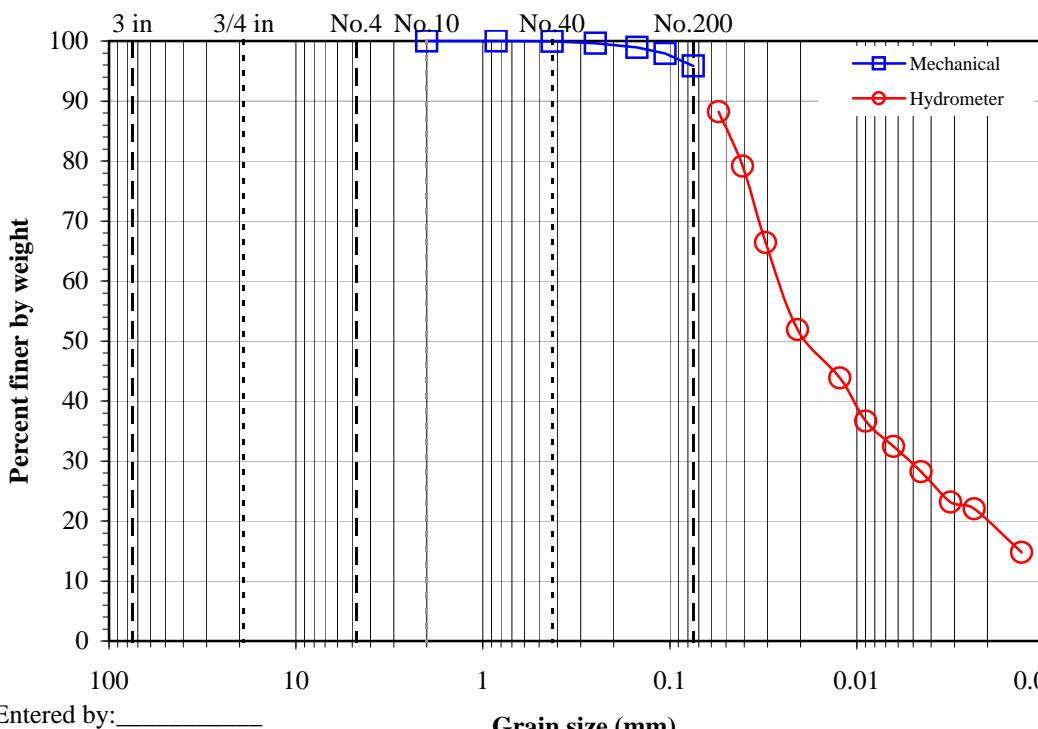
Entered by: _____
Reviewed: _____

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP008-01****Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)		
Split sieve:	Yes			Moist soil + tare (g):	-	111.09	111.09		
Split sieve:	#10			Dry soil + tare (g):	-	109.59	109.59		
		Moist	Dry	Tare (g):	-	37.30	37.30		
Total sample wt. (g):	56.17	55.03		Water content (%):	0.00	2.07	2.07		
+#10 Coarse fraction (g):		0.00		Hydrometer data		Slope:	-0.1641		
-#10 Split fraction (g):	56.17	55.03		Hyd. split:	No.10	Intercept:	16.3		
Hydrometer fraction (g):	56.17	55.03		Gs:	2.65	Assumed	α: 1.00		
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00		
				Dispersion period (min):	15	Dispersion device:	Air-jet		
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension	
8"	-	200	-	0.5	17.9	52.5	0.05493	88.23	
6"	-	150	-	1	17.9	47.5	0.04086	79.14	
4"	-	100	-	2	17.9	40.5	0.03078	66.42	
3"	-	75	-	5	17.9	32.5	0.02075	51.88	
1.5"	-	37.5	-	15	18.2	28	0.01233	43.83	
3/4"	-	19	-	30	18.4	24	0.00894	36.64	
3/8"	-	9.5	-	60	19.2	21.5	0.00636	32.41	
No.4	-	4.75	-	120	20	19	0.00452	28.19	
No.10	-	2	100.0	<=Split	250	21.1	16	0.00315	23.17
No.20	0.01	0.85	100.0		436	22.8	15	0.00235	22.03
No.40	0.02	0.425	100.0		1461	22.8	11	0.00131	14.76
No.60	0.22	0.25	99.6						
No.100	0.60	0.15	98.9						
No.140	1.14	0.106	97.9						
No.200	2.28	0.075	95.9						

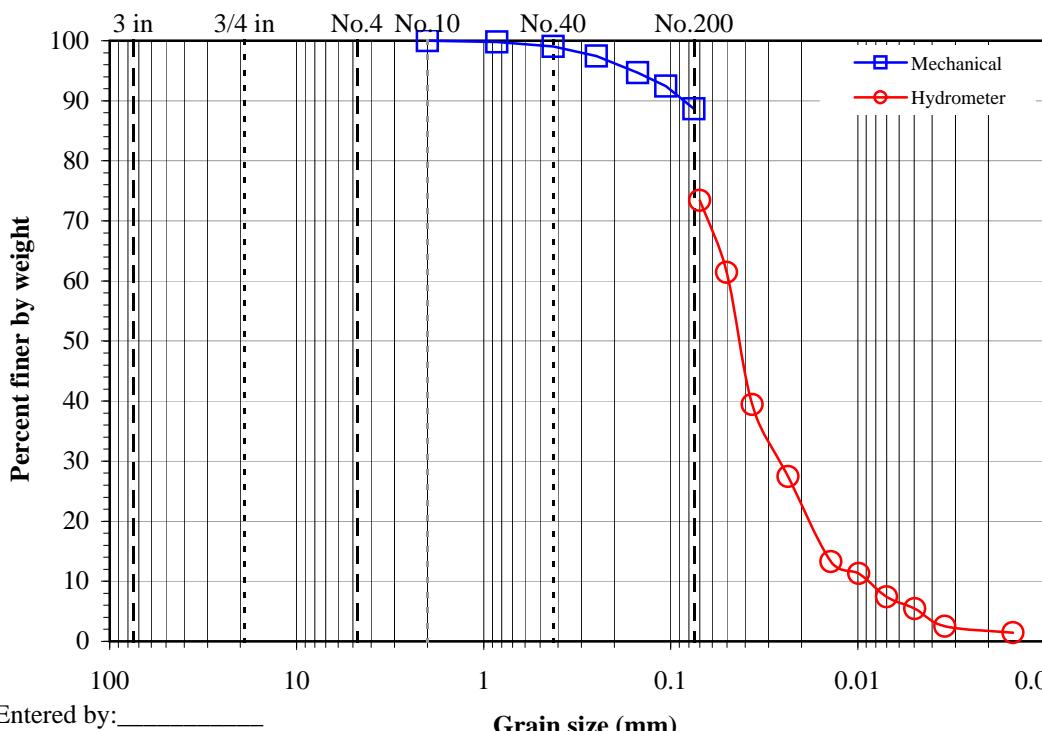
Entered by: _____
Reviewed: _____

Particle-Size Analysis of Soils with hydrometer

(ASTM D4221)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR**
 **IGES**
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Boring No.: WUA-TP008-01**Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+#10)	S.F.(-#10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	-	111.09	111.09	
Split sieve:	#10			Dry soil + tare (g):	-	109.59	109.59	
		Moist	Dry	Tare (g):	-	37.30	37.30	
Total sample wt. (g):	25.52	25.00		Water content (%):	0.00	2.07	2.07	
+#10 Coarse fraction (g):		0.00		Hydrometer data		Slope:	-0.1641	
-#10 Split fraction (g):	25.52	25.00		Hyd. split:	No.10	Intercept:	16.3	
Hydrometer fraction (g):	25.52	25.00		Gs:	2.65	Assumed	α: 1.00	
Split fraction:	1.000			Bulb No.	2	Hyd. fraction:	100.00	
				Vacuum period (min):	10	Dispersion device:	None	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	20.8	18	0.06984	73.41
6"	-	150	-	1	20.8	15	0.05029	61.41
4"	-	100	-	2	20.8	9.5	0.03670	39.41
3"	-	75	-	5	20.8	6.5	0.02360	27.41
1.5"	-	37.5	-	15	20.7	3	0.01389	13.28
3/4"	-	19	-	30	20.7	2.5	0.00985	11.28
3/8"	-	9.5	-	60	20.8	1.5	0.00699	7.41
No.4	-	4.75	-	120	20.8	1	0.00496	5.41
No.10	-	2	100.0	250	21.6	0	0.00342	2.48
No.20	0.05	0.85	99.8	1370	20.8	0	0.00147	1.41
No.40	0.24	0.425	99.0					
No.60	0.64	0.25	97.4					
No.100	1.33	0.15	94.7					
No.140	1.89	0.106	92.4					
No.200	2.84	0.075	88.6					

Entered by: _____
Reviewed: _____

Dispersive Characteristics of Clay Soil by Double Hydrometer

(ASTM D 4221)

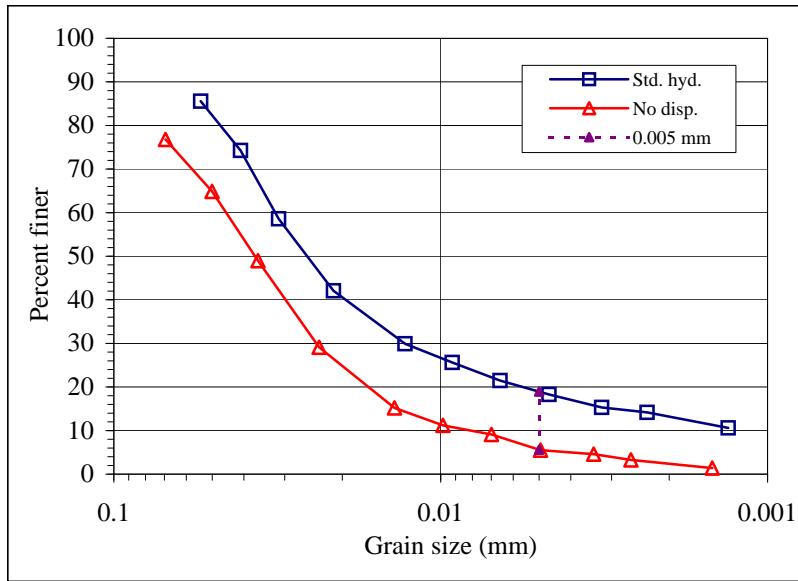


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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP009-01**Sample:****Depth:** 1-10'**Description:** Brown silty clay

Percent passing 5 um (ASTM D 4221) =	5.62
Percent passing 5 um (ASTM D 422) =	18.93
Percent Dispersion =	29.7

Standard Hyd. (ASTM D 422)		Double Hyd. (ASTM D 4221)	
I	J	I	J
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0542	85.6	0.0695	76.8
0.0409	74.3	0.0500	64.9
0.0313	58.6	0.0362	49.0
0.0213	42.1	0.0236	29.1
0.0129	29.9	0.0139	15.2
0.0092	25.6	0.0098	11.2
0.0066	21.5	0.0070	9.1
0.0047	18.3	0.0049	5.5
0.0032	15.3	0.0034	4.6
0.0023	14.2	0.0026	3.3
0.0013	10.6	0.0015	1.4



Entered by: _____

Reviewed: _____

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

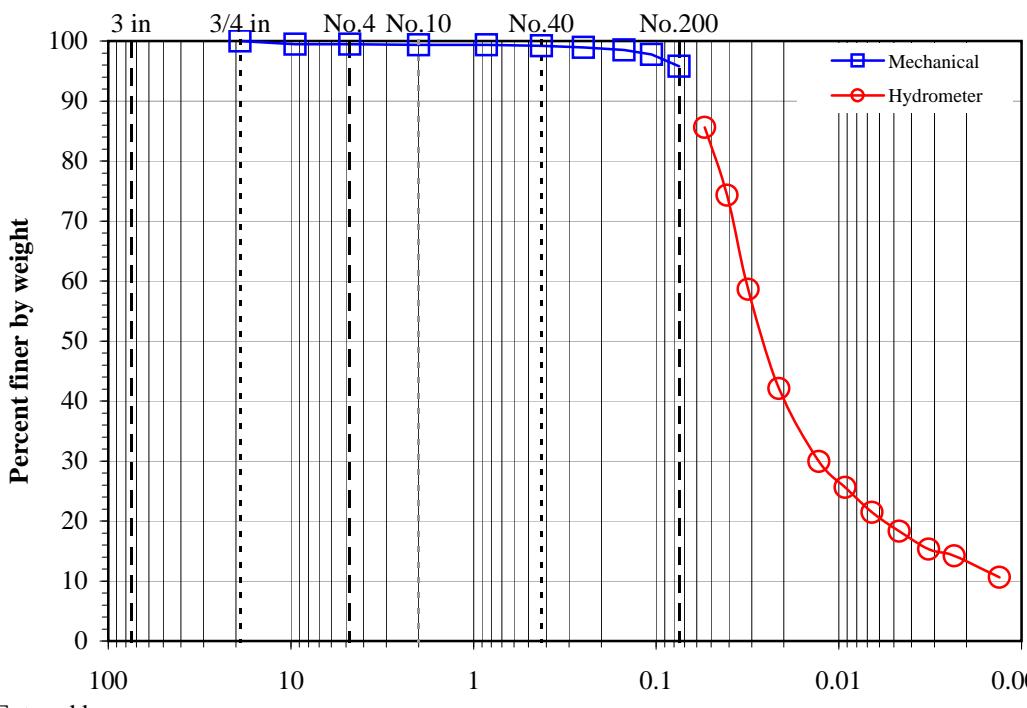
Date: 11/18/2013

By: BRR

**Boring No.: WUA-TP009-01****Sample:****Depth: 1-10'**

Description: Brown silty clay

				Water content data	C.F.(+3/8")	S.F.(-3/8")	Hyd.(+No.10)	Hyd.(-No.10)
Split sieve:	Yes			Moist soil + tare (g):	241.03	660.11	38.52	55.26
Split sieve:	3/8"			Dry soil + tare (g):	240.59	619.64	38.51	54.97
		Moist	Dry	Tare (g):	126.36	123.24	37.81	37.72
Total sample wt. (g):	22005.77	20355.03		Water content (%):	0.39	8.15	1.43	1.68
+3/8" Coarse fraction (g):	112.96	112.53		<u>Hydrometer data</u>				
-3/8" Split fraction (g):	518.78	511.47		Hyd. split:	No.10		Slope:	-0.1641
Hydrometer fraction (g):	58.07	57.11		Gs:	2.65	Assumed	Intercept:	16.3
Split fraction:	0.994			Bulb No.	2		α :	1.00
				Dispersion period (min):	15		Hyd. fraction:	99.37
							Dispersion device:	Air-jet
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	18.5	53	0.05422	85.58
6"	-	150	-	1	18.5	46.5	0.04094	74.27
4"	-	100	-	2	18.5	37.5	0.03132	58.61
3"	-	75	-	5	18.5	28	0.02127	42.08
1.5"	-	37.5	-	15	18.6	21	0.01286	29.94
3/4"	-	19	100.0	30	18.7	18.5	0.00922	25.62
3/8"	112.53	9.5	99.4	<=Split	60	19.2	16	0.00658
No.4	-	4.75	99.4		120	20	14	0.00466
No.10	0.39	2	99.4	<=Split hyd.	250	21.3	12	0.00322
No.20	0.01	0.85	99.4		461	22.9	11	0.00234
No.40	0.11	0.425	99.2		1486	22.7	9	0.00132
No.60	0.25	0.25	98.9					
No.100	0.50	0.15	98.5					
No.140	0.92	0.106	97.8					
No.200	2.07	0.075	95.8					



Entered by: _____

Reviewed: _____

Gravel (%): 0.6
 Sand (%): 3.7
 Fines (%): 95.8

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

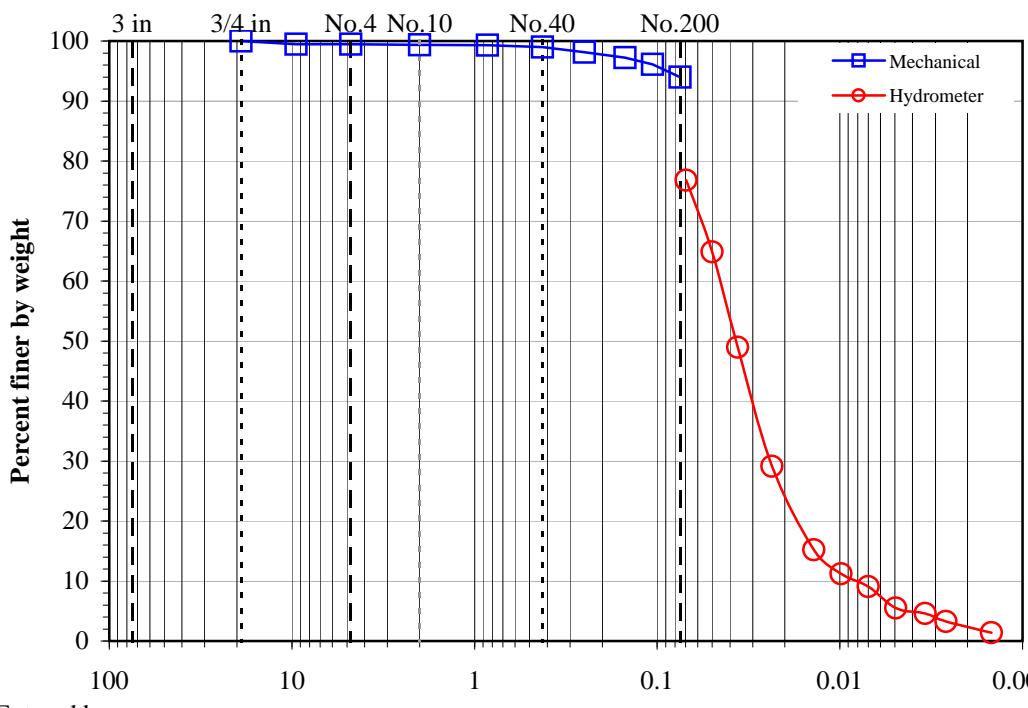
Date: 11/18/2013

By: BRR

Boring No.: WUA-TP009-01**Sample:****Depth: 1-10'**

Description: Brown silty clay

				Water content data	C.F.(+3/8")	S.F.(-3/8")	Hyd.(+No.10)	Hyd.(-No.10)
Split sieve:	Yes			Moist soil + tare (g):	241.03	660.11	38.52	55.26
Split sieve:	3/8"			Dry soil + tare (g):	240.59	619.64	38.51	54.97
		Moist	Dry	Tare (g):	126.36	123.24	37.81	37.72
Total sample wt. (g):	22005.77	20355.03		Water content (%):	0.39	8.15	1.43	1.68
+3/8" Coarse fraction (g):	112.96	112.53		<u>Hydrometer data</u>				
-3/8" Split fraction (g):	518.78	511.47		Hyd. split:	No.10		Slope:	-0.1641
Hydrometer fraction (g):	25.42	25.00		Gs:	2.65	Assumed	Intercept:	16.3
Split fraction:	0.994			Bulb No.	2		α :	1.00
				Vacuum period (min):	10		Hyd. fraction:	99.37
							Dispersion device:	None
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	20.7	19	0.06948	76.79
6"	-	150	-	1	20.7	16	0.05004	64.87
4"	-	100	-	2	20.7	12	0.03622	48.97
3"	-	75	-	5	20.7	7	0.02356	29.09
1.5"	-	37.5	-	15	20.7	3.5	0.01386	15.18
3/4"	-	19	100.0	30	20.7	2.5	0.00985	11.21
3/8"	112.53	9.5	99.4	<=Split	60	20.6	2	0.00699
No.4	-	4.75	99.4		120	20.9	1	0.00495
No.10	0.39	2	99.4	<=Split hyd.	250	21.7	0.5	0.00341
No.20	0.02	0.85	99.3		420	22.2	0	0.00262
No.40	0.10	0.425	99.0		1367	20.8	0	0.00148
No.60	0.31	0.25	98.1					
No.100	0.54	0.15	97.2					
No.140	0.82	0.106	96.1					
No.200	1.36	0.075	94.0					



Entered by: _____

Reviewed: _____

Gravel (%): 0.6
Sand (%): 5.5
Fines (%): 94.0

Comments:
 Vacuum applied and no flocculating agent used.

Dispersive Characteristics of Clay Soil by Double Hydrometer

(ASTM D 4221)

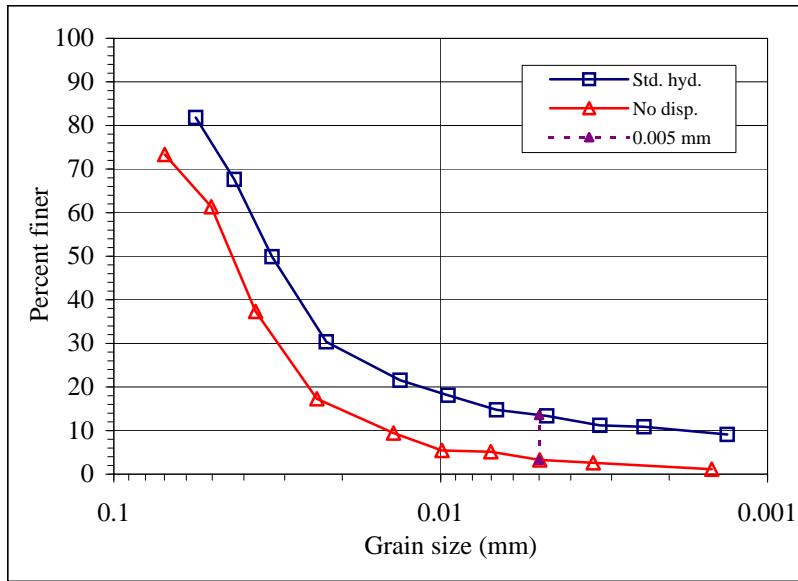


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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 11/18/2013**By:** BRR**Boring No.:** WUA-TP010-01**Sample:****Depth:** 1-10'**Description:** Brown silt

Percent passing 5 um (ASTM D 4221) =	3.31
Percent passing 5 um (ASTM D 422) =	13.58
Percent Dispersion =	24.4

Standard Hyd. (ASTM D 422)		Double Hyd. (ASTM D 4221)	
I	J	I	J
Particle size (mm)	Percent finer	Particle size (mm)	Percent finer
0.0562	81.8	0.0699	73.4
0.0428	67.6	0.0503	61.3
0.0328	49.9	0.0368	37.3
0.0224	30.4	0.0239	17.3
0.0133	21.5	0.0139	9.4
0.0095	18.1	0.0099	5.4
0.0067	14.8	0.0070	5.2
0.0047	13.4	0.0050	3.3
0.0033	11.2	0.0034	2.6
0.0024	10.9	0.0015	1.1
0.0013	9.1		



Entered by:_____

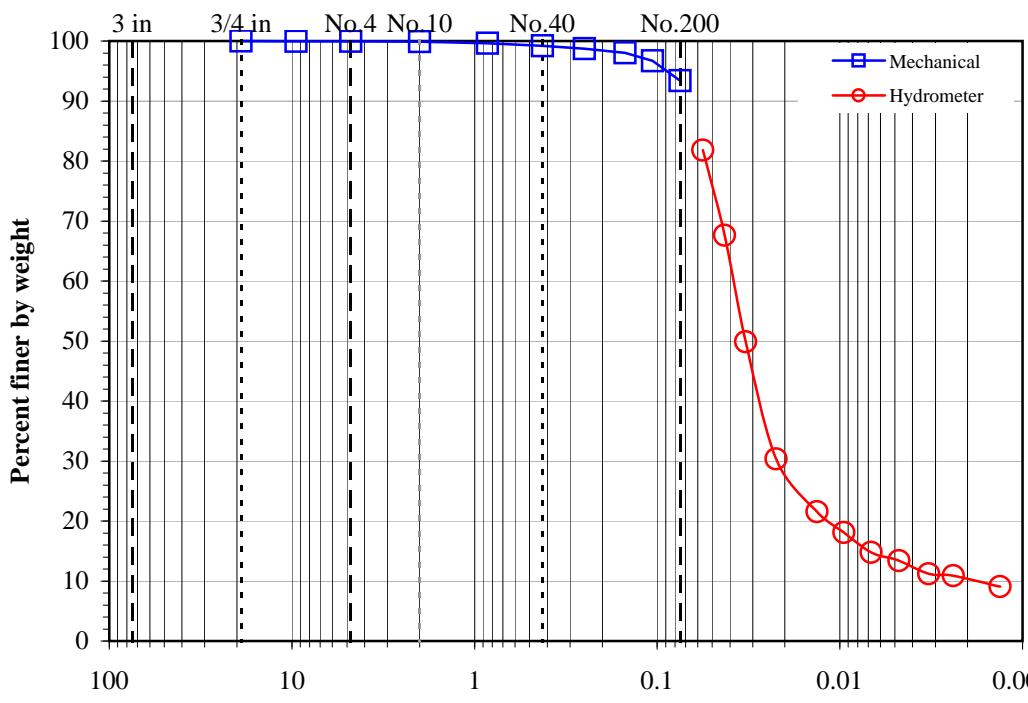
Reviewed:_____

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP010-01****Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+3/8")	S.F.(-3/8")	Hyd.(+No.10)	Hyd.(-No.10)	
Split sieve:	Yes			Moist soil + tare (g):	140.19	485.30	36.95	60.98	
Split sieve:	3/8"			Dry soil + tare (g):	140.06	464.88	36.95	60.64	
		Moist	Dry	Tare (g):	124.07	124.07	36.93	37.60	
Total sample wt. (g):	21537.22	20320.52		Water content (%):	0.81	5.99	0.00	1.48	
+3/8" Coarse fraction (g):	16.12	15.99		<u>Hydrometer data</u>					
-3/8" Split fraction (g):	373.84	373.84		Hyd. split:	No.10		Slope:	-0.1641	
Hydrometer fraction (g):	57.15	56.32		Gs:	2.65	Assumed	Intercept:	16.3	
Split fraction:	0.999			Bulb No.	2		α :	1.00	
				Dispersion period (min):	15		Hyd. fraction:	99.92	
							Dispersion device:	Air-jet	
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer		Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-		0.5	18.2	50	0.05616	81.82
6"	-	150	-		1	18.2	42	0.04281	67.63
4"	-	100	-		2	18.2	32	0.03281	49.88
3"	-	75	-		5	18.2	21	0.02238	30.37
1.5"	-	37.5	-		15	18.3	16	0.01331	21.54
3/4"	-	19	100.0		30	18.6	14	0.00949	18.10
3/8"	15.99	9.5	99.9	=Split	60	19.1	12	0.00675	14.75
No.4	-	4.75	99.9		120	20.1	11	0.00474	13.36
No.10	0.01	2	99.9	=Split hyd.	250	21.4	9.5	0.00326	11.21
No.20	0.15	0.85	99.7		453	22.8	9	0.00239	10.86
No.40	0.40	0.425	99.2		1477	22.8	8	0.00133	9.09
No.60	0.67	0.25	98.7						
No.100	1.06	0.15	98.0						
No.140	1.82	0.106	96.7						
No.200	3.67	0.075	93.4						



Entered by: _____

Reviewed: _____

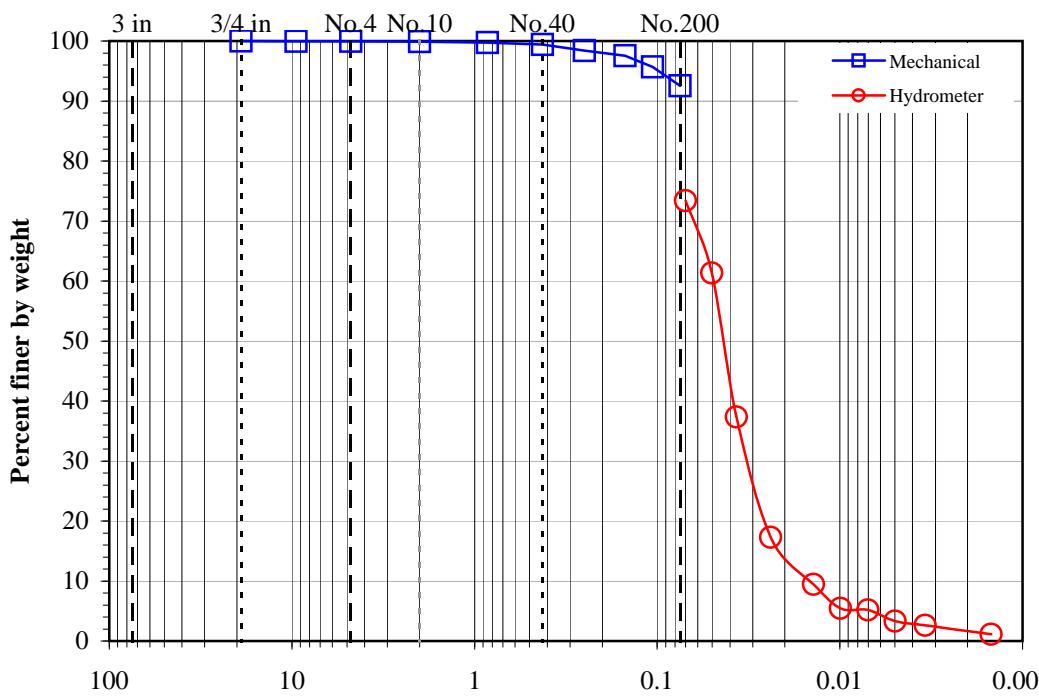
Gravel (%): 0.1
Sand (%): 6.5
Fines (%): 93.4

Particle-Size Analysis of Soils with hydrometer

(ASTM D422)

Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/18/2013****By: BRR****Boring No.: WUA-TP010-01****Sample:****Depth: 1-10'****Description: Brown silt**

				Water content data	C.F.(+3/8")	S.F.(-3/8")	Hyd.(+No.10)	Hyd.(-No.10)
Split sieve:	Yes			Moist soil + tare (g):	140.19	485.30	36.95	60.98
Split sieve:	3/8"			Dry soil + tare (g):	140.06	464.88	36.95	60.64
		Moist	Dry	Tare (g):	124.07	124.07	36.93	37.60
Total sample wt. (g):	21537.22	20320.52		Water content (%):	0.81	5.99	0.00	1.48
+3/8" Coarse fraction (g):	16.12	15.99		<u>Hydrometer data</u>				
-3/8" Split fraction (g):	373.84	373.84		Hyd. split:	No.10		Slope:	-0.1641
Hydrometer fraction (g):	25.32	24.95		Gs:	2.65	Assumed	Intercept:	16.3
Split fraction:	0.999			Bulb No.	2		α :	1.00
				Vacuum period (min):	10		Hyd. fraction:	99.92
							Dispersion device:	None
Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	Elapsed time (min)	Temp. (°C)	Hydrometer Reading	Grain Size (mm)	% Soil in Suspension
8"	-	200	-	0.5	20.7	18	0.06991	73.36
6"	-	150	-	1	20.7	15	0.05034	61.35
4"	-	100	-	2	20.7	9	0.03684	37.32
3"	-	75	-	5	20.7	4	0.02394	17.30
1.5"	-	37.5	-	15	20.8	2	0.01395	9.42
3/4"	-	19	100.0	30	20.8	1	0.00991	5.42
3/8"	15.99	9.5	99.9	<=Split	60	20.6	1	0.00703
No.4	-	4.75	99.9		120	20.7	0.5	0.00497
No.10	0.01	2	99.9	<=Split hyd.	250	21.7	0	0.00341
No.20	0.05	0.85	99.7		1363	20.6	0	0.00148
No.40	0.13	0.425	99.4					
No.60	0.38	0.25	98.4					
No.100	0.59	0.15	97.6					
No.140	1.06	0.106	95.7					
No.200	1.85	0.075	92.5					



Entered by: _____

Reviewed: _____

DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)

**Project:** MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP001-01**Sample:****Depth:** 1-10'**Sample Description:** Brown silty clay**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 61.86

Dry soil + tare (g) 58.92

Tare (g) 37.78

Water content, w (%) 13.9

Initial water temperature: 20.1 °C

Date test started: 11/20/2013

Time at beginning of test: 9:31

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	2	20.2	2	19.6	2	19.4
2	2	20	2	19.3	2	19.5
3	1	19.5	1	18.8	2	20
4	1	19.7	1	19	2	20.2

Dispersive classification: Grade 2-Intermediate

Entered: _____

Reviewed: _____

DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)

**Project:** MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP002-01**Sample:****Depth:** 1-10'**Sample Description:** Brown clay**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 51.71

Dry soil + tare (g) 49.86

Tare (g) 36.95

Water content, w (%) 14.3

Initial water temperature: 20 °C

Date test started: 11/20/2013

Time at beginning of test: 9:32

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	2	20	2	19.2	2	19.6
2	2	20	2	19.2	2	19.6
3	1	19.5	1	18.9	2	19.9
4	2	19.7	2	19	2	20

Dispersive classification: Grade 2-Intermediate

Entered: _____

Reviewed: _____

DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)

**Project:** MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP003-01**Sample:****Depth:** 1-10'**Sample Description:** Brown silty clay**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 76.19

Dry soil + tare (g) 74.20

Tare (g) 37.76

Water content, w (%) 5.5

Initial water temperature: 19.9 °C

Date test started: 11/20/2013

Time at beginning of test: 9:32

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	3	19.9	3	19.1	2	19.5
2	3	20	3	19.1	2	19.7
3	1	20.1	1	19.3	1	18.5
4	1	20	1	19.2	1	18.5

Dispersive classification: Grade 3-Dispersive

Entered: _____

Reviewed: _____

DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)

**Project:** MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP004-01**Sample:****Depth:** 1-10'**Sample Description:** Brown silt**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 59.79

Dry soil + tare (g) 58.67

Tare (g) 37.72

Water content, w (%) 5.3

Initial water temperature: 19.6 °C

Date test started: 11/21/2013

Time at beginning of test: 9:06

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	1	19.7	2	18.1	1	18.3
2	2	19.6	1	18	1	18.3

Dispersive classification: Grade 1-Nondispersible

Entered: _____

Reviewed: _____

DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)



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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP005-01**Sample:****Depth:** 1-10'**Sample Description:** Brown silt**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 63.86

Dry soil + tare (g) 62.44

Tare (g) 37.70

Water content, w (%) 5.7

Initial water temperature: 19.5 °C

Date test started: 11/21/2013

Time at beginning of test: 9:06

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	1	19.5	1	17.8	1	18.3
2	2	19.5	1	17.9	1	18.3

Dispersive classification: Grade 1-Nondispersible

Entered: _____

Reviewed: _____

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DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)

**Project:** MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP006-01**Sample:****Depth:** 1-10'**Sample Description:** Brown silty clay**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 61.25

Dry soil + tare (g) 59.25

Tare (g) 37.25

Water content, w (%) 9.1

Initial water temperature: 19.6 °C

Date test started: 11/21/2013

Time at beginning of test: 9:06

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	2	19.5	2	18	2	18.3
2	3	19.6	3	18	3	18.3

Dispersive classification: Grade 3-Dispersive

Entered: _____

Reviewed: _____

DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)



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Project: MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP007-01**Sample:****Depth:** 1-10'**Sample Description:** Brown silt**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 68.30

Dry soil + tare (g) 65.27

Tare (g) 37.59

Water content, w (%) 10.9

Initial water temperature: 19 °C

Date test started: 11/22/2013

Time at beginning of test: 8:58

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	1	18.9	1	18.4	1	18.2
2	2	19	2	18.3	2	18.4

Dispersive classification: Grade 2-Intermediate

Entered: _____

Reviewed: _____

DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)

**Project:** MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP008-01**Sample:****Depth:** 1-10'**Sample Description:** Brown silt**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 63.64

Dry soil + tare (g) 62.32

Tare (g) 37.82

Water content, w (%) 5.4

Initial water temperature: 19.1 °C

Date test started: 11/22/2013

Time at beginning of test: 8:58

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	3	19.1	3	18.3	3	18.2
2	1	19	1	18.4	1	18.2

Dispersive classification: Grade 2-Intermediate

Entered: _____

Reviewed: _____

DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)

**Project:** MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP009-01**Sample:****Depth:** 1-10'**Sample Description:** Brown silty clay**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 55.50

Dry soil + tare (g) 54.17

Tare (g) 38.14

Water content, w (%) 8.3

Initial water temperature: 19 °C

Date test started: 11/22/2013

Time at beginning of test: 8:58

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	1	19	1	18.4	1	18.2
2	1	19	1	18.4	1	18.2

Dispersive classification: Grade 1-Nondispersible

Entered: _____

Reviewed: _____

DETERMINING DISPERSIVE CHARACTERISTICS OF CLAYEY SOILS BY THE CRUMB TEST

(ASTM D6572)

**Project:** MWH**No:** 00303-014**Location:** FMC RDRA Data Gap Investigation**Date:** 12/3/2013**By:** BRR**Boring No.:** WUA-TP010-01**Sample:****Depth:** 1-10'**Sample Description:** Brown silt**Engineering Classification:** Not requested**Specimen Type:** Natural irregularly shaped crumb

Specific Gravity, Gs: 2.65 Assumed

Curing Time: 0 minutes

Water used: Distilled

Water content: Natural

Wet soil + tare (g) 55.73

Dry soil + tare (g) 54.92

Tare (g) 37.60

Water content, w (%) 4.7

Initial water temperature: 19.8 °C

Date test started: 11/26/2013

Time at beginning of test: 8:58

Specimen Number	2 minutes		1 hour		6 hours	
	Grade	Temp. (°C)	Grade	Temp. (°C)	Grade	Temp. (°C)
1	1	20	1	19.1	1	20.7
2	1	19.7	1	19	1	20

Dispersive classification: Grade 1-Nondispersible

Entered: _____

Reviewed: _____

Laboratory Compaction Characteristics of Soil
 (ASTM D698 / D1557)

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Project: MWH

No: 00303-014

Location: FMC RDRA Data Gap Investigation

Date: 11/21/2013

By: MP

Method: ASTM D698 B

Mold Id. Inc 2

Mold volume (ft³): 0.0332

Boring No.: WUA-TP001-01

Sample:

Depth: 1-10'

Sample Description: Brown silty clay

Engineering Classification: Not requested

As-received water content (%): Not requested

Preparation method: Moist

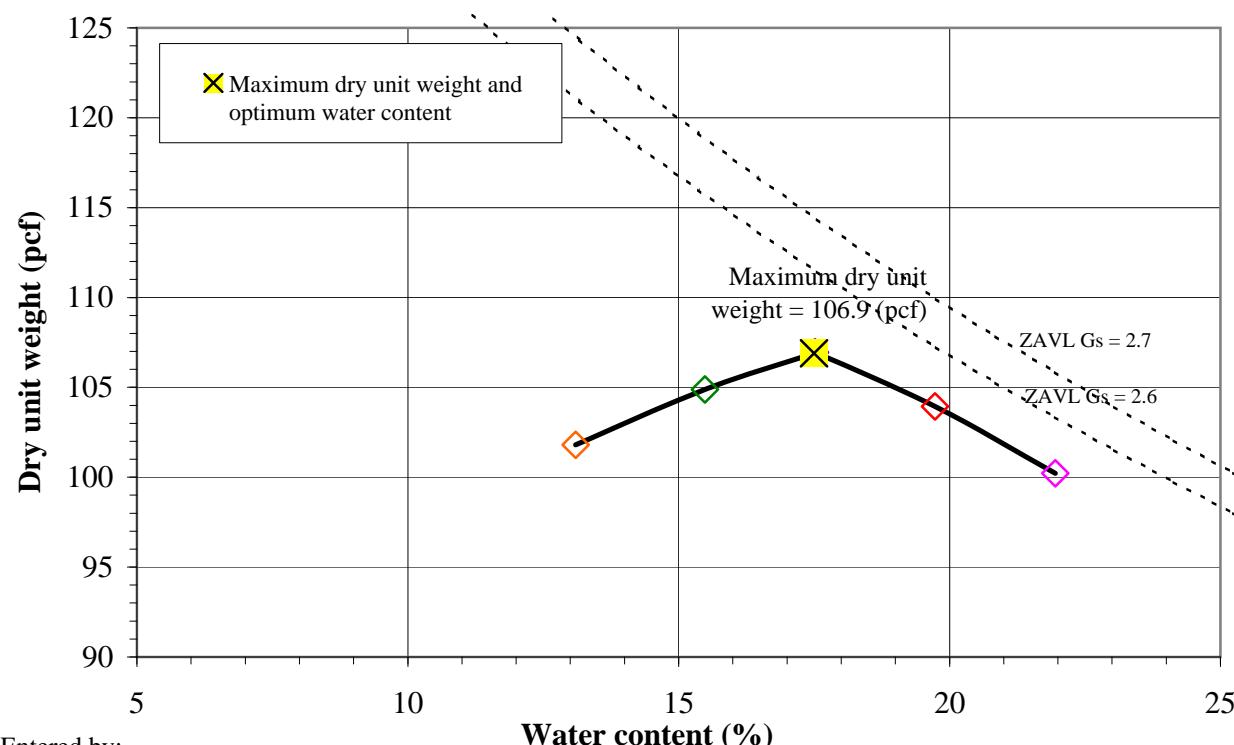
Rammer: Mechanical-circular face

Rock Correction: No

Optimum water content (%): 17.5

Maximum dry unit weight (pcf): 106.9

Point Number	+4%	+6%	+2%	+8%	As Is			
Wt. Sample + Mold (g)	6055.2	6036.4	5986.4	6003.0	5896.2			
Wt. of Mold (g)	4160.1	4160.1	4160.1	4160.1	4160.1			
Wet Unit Wt., γ_m (pcf)	125.7	124.4	121.1	122.2	115.1			
Wet Soil + Tare (g)	565.86	646.42	627.72	578.78	537.19			
Dry Soil + Tare (g)	499.95	563.05	560.18	497.56	489.13			
Tare (g)	123.73	140.46	123.93	127.54	122.22			
Water Content, w (%)	17.5	19.7	15.5	22.0	13.1			
Dry Unit Wt., γ_d (pcf)	106.9	103.9	104.9	100.2	101.8			



Entered by: _____

Reviewed: _____

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

 **IGES**
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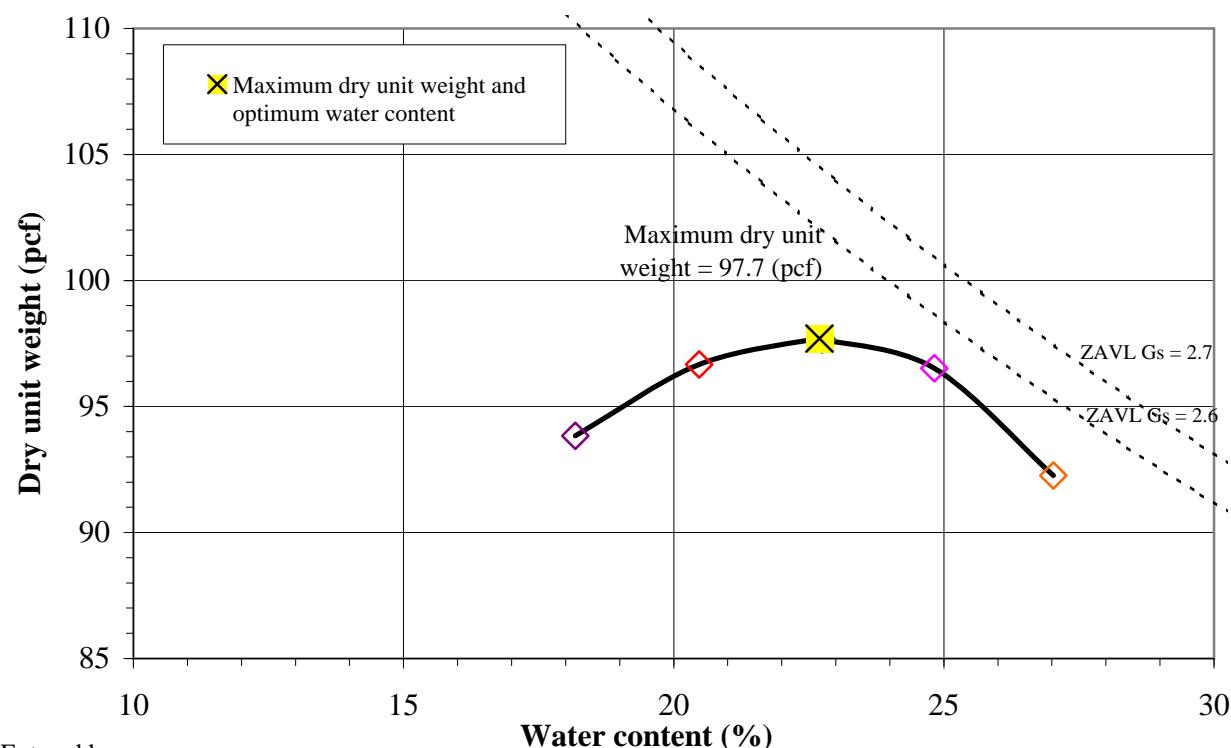
Project: MWH
No: 00303-014
Location: FMC RDRA Data Gap Investigation
Date: 11/21/2013
By: DKS
Method: ASTM D698 B
Mold Id. Inc 2
Mold volume (ft³): 0.0332

Boring No.: WUA-TP002-01
Sample:
Depth: 1-10'
Sample Description: Brown clay
Engineering Classification: Not requested
As-received water content (%): Not requested
Preparation method: Moist
Rammer: Mechanical-circular face
Rock Correction: No

Optimum water content (%): 22.7

Maximum dry unit weight (pcf): 97.7

Point Number	+4%	+6%	+8%	+10%	+12%			
Wt. Sample + Mold (g)	5832.2	5916.0	5967.7	5976.6	5927.2			
Wt. of Mold (g)	4160.1	4160.1	4160.1	4160.1	4160.1			
Wet Unit Wt., γ_m (pcf)	110.9	116.5	119.9	120.5	117.2			
Wet Soil + Tare (g)	629.80	842.24	824.58	833.17	945.37			
Dry Soil + Tare (g)	551.61	723.01	694.50	691.81	790.71			
Tare (g)	121.43	140.49	122.65	122.35	218.49			
Water Content, w (%)	18.2	20.5	22.7	24.8	27.0			
Dry Unit Wt., γ_d (pcf)	93.8	96.7	97.7	96.5	92.3			



Entered by: _____

Reviewed: _____

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)



Project: MWH

No: 00303-014

Location: FMC RDRA Data Gap Investigation

Date: 11/21/2013

By: MP/DKS

Method: ASTM D698 B

Mold Id. Inc 2

Mold volume (ft³): 0.0332

Boring No.: WUA-TP003-01

Sample:

Depth: 1-10'

Sample Description: Brown silty clay

Engineering Classification: Not requested

As-received water content (%): Not requested

Preparation method: Moist

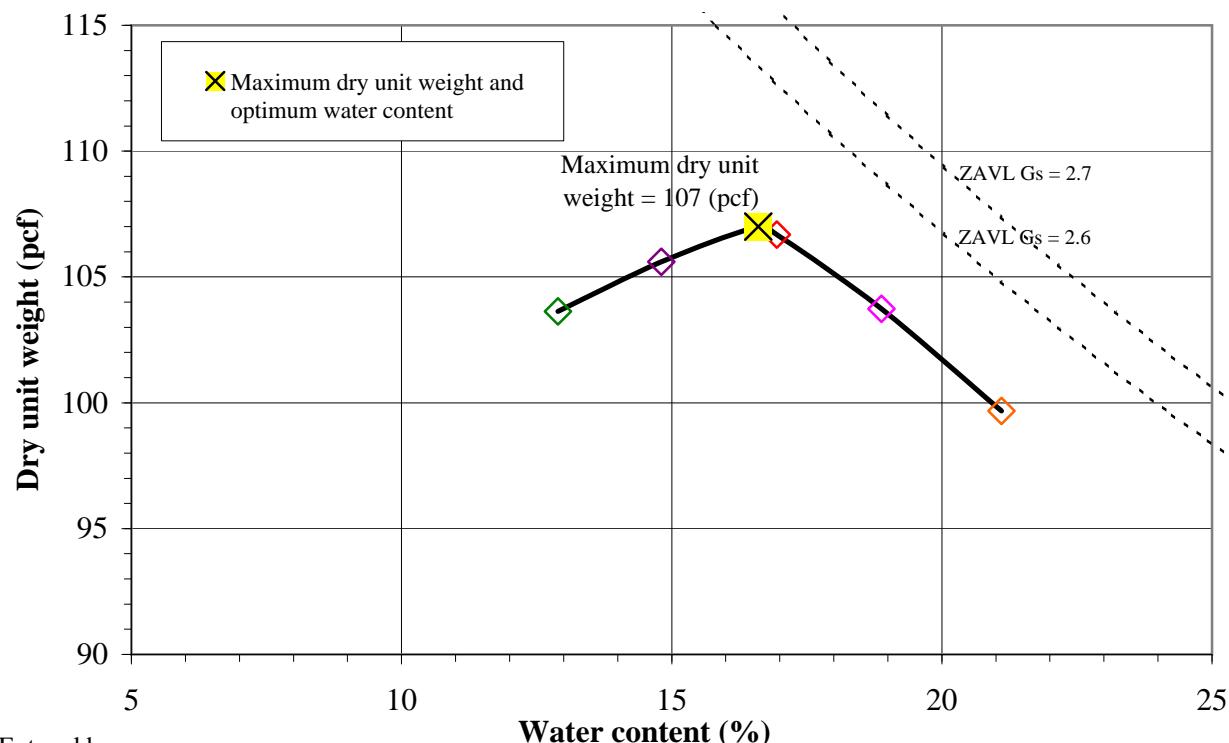
Rammer: Mechanical-circular face

Rock Correction: No

Optimum water content (%): 16.6

Maximum dry unit weight (pcf): 107

Point Number	+8%	+10%	+6%	+12%	+14%			
Wt. Sample + Mold (g)	5988.2	6041.3	5924.3	6019.6	5980.3			
Wt. of Mold (g)	4160.1	4160.1	4160.1	4160.1	4160.1			
Wet Unit Wt., γ_m (pcf)	121.2	124.8	117.0	123.3	120.7			
Wet Soil + Tare (g)	866.98	843.94	686.43	765.24	862.82			
Dry Soil + Tare (g)	770.44	740.20	622.12	665.90	734.68			
Tare (g)	118.56	127.94	123.43	139.73	127.41			
Water Content, w (%)	14.8	16.9	12.9	18.9	21.1			
Dry Unit Wt., γ_d (pcf)	105.6	106.7	103.6	103.7	99.7			



Entered by: _____

Reviewed: _____

Laboratory Compaction Characteristics of Soil
 (ASTM D698 / D1557)

 **IGES**
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Project: MWH
No: 00303-014

Location: FMC RDRA Data Gap Investigation

Date: 11/21/2013

By: MP/DKS

Method: ASTM D698 B

Mold Id. Inc 2

Mold volume (ft³): 0.0332

Boring No.: WUA-TP004-01

Sample:

Depth: 1-10'

Sample Description: Brown silt

Engineering Classification: Not requested

As-received water content (%): Not requested

Preparation method: Moist

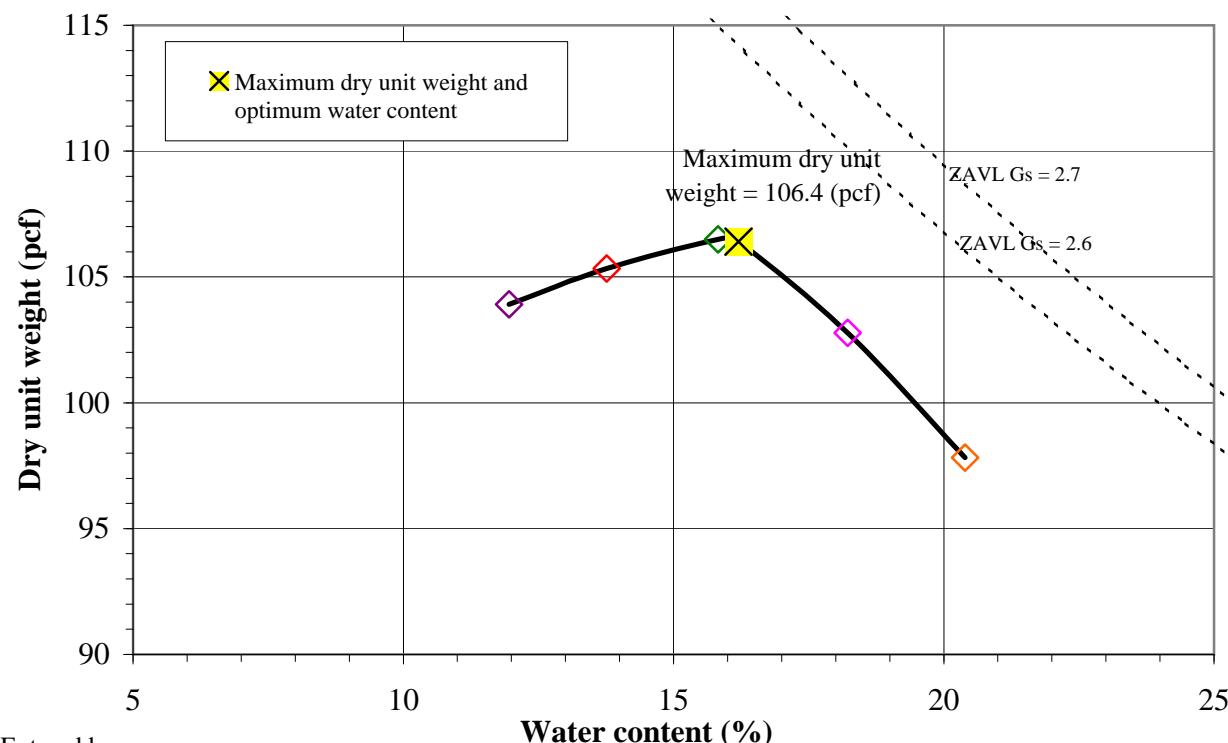
Rammer: Mechanical-circular face

Rock Correction: No

Optimum water content (%): 16.2

Maximum dry unit weight (pcf): 106.4

Point Number	+6%	+8%	+10%	+12%	+14%			
Wt. Sample + Mold (g)	5914.3	5967.1	6019.8	5992.2	5936.0			
Wt. of Mold (g)	4160.1	4160.1	4160.1	4160.1	4160.1			
Wet Unit Wt., γ_m (pcf)	116.3	119.8	123.3	121.5	117.8			
Wet Soil + Tare (g)	793.31	785.16	729.94	720.77	811.93			
Dry Soil + Tare (g)	721.64	705.54	647.18	631.53	704.92			
Tare (g)	122.18	127.09	124.09	141.72	180.27			
Water Content, w (%)	12.0	13.8	15.8	18.2	20.4			
Dry Unit Wt., γ_d (pcf)	103.9	105.3	106.5	102.8	97.8			



Entered by: _____

Reviewed: _____

Laboratory Compaction Characteristics of Soil
 (ASTM D698 / D1557)

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Project: MWH

No: 00303-014

Location: FMC RDRA Data Gap Investigation

Date: 11/21/2013

By: BRR/DKS

Method: ASTM D698 B

Mold Id. Inc 3

Mold volume (ft³): 0.0332

Boring No.: WUA-TP005-01

Sample:

Depth: 1-10'

Sample Description: Brown silt

Engineering Classification: Not requested

As-received water content (%): Not requested

Preparation method: Moist

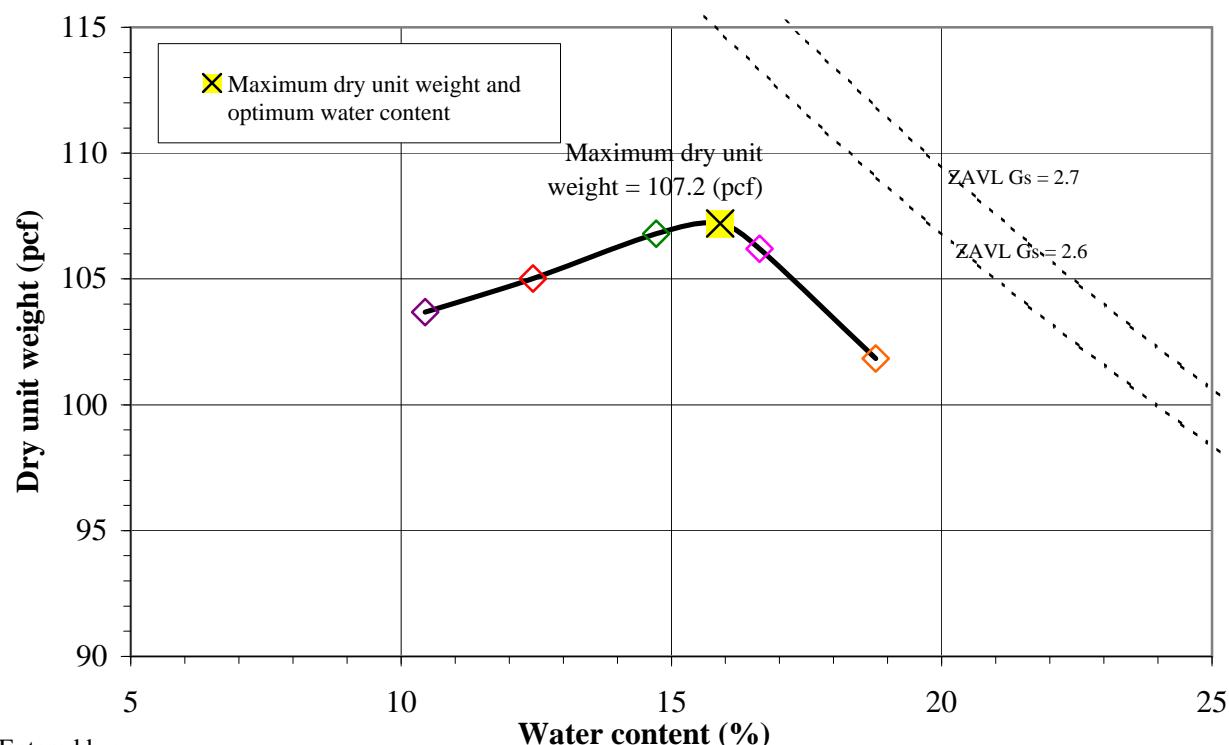
Rammer: Mechanical-circular face

Rock Correction: No

Optimum water content (%): 15.9

Maximum dry unit weight (pcf): 107.2

Point Number	+4%	+6%	+8%	+10%	+12%			
Wt. Sample + Mold (g)	5895.4	5949.1	6015.9	6036.1	5992.4			
Wt. of Mold (g)	4169.7	4169.7	4169.7	4169.7	4169.7			
Wet Unit Wt., γ_m (pcf)	114.5	118.1	122.5	123.9	121.0			
Wet Soil + Tare (g)	877.44	816.01	868.81	804.39	907.87			
Dry Soil + Tare (g)	815.25	750.77	784.50	715.24	784.48			
Tare (g)	219.83	226.30	211.70	179.20	127.34			
Water Content, w (%)	10.4	12.4	14.7	16.6	18.8			
Dry Unit Wt., γ_d (pcf)	103.7	105.0	106.8	106.2	101.8			



Entered by: _____

Reviewed: _____

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)



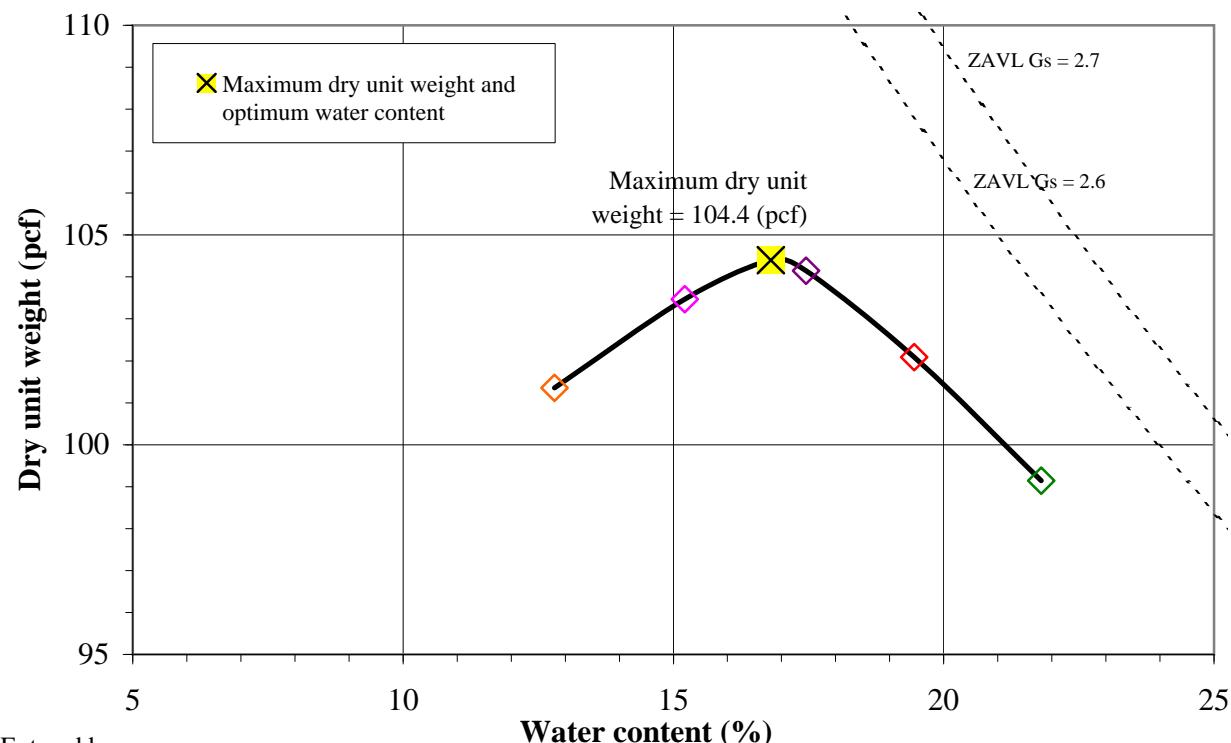
Project: MWH
No: 00303-014
Location: FMC RDRA Data Gap Investigation
Date: 11/8/2013
By: ET
Method: ASTM D698 B
Mold Id. Inc 1
Mold volume (ft³): 0.0333

Boring No.: WUA-TP006-01
Sample:
Depth: 1-10'
Sample Description: Brown silty clay
Engineering Classification: Not requested
As-received water content (%): Not requested
Preparation method: Moist
Rammer: Mechanical-circular face
Rock Correction: No

Optimum water content (%): 16.8

Maximum dry unit weight (pcf): 104.4

Point Number	+4%	+6%	+8%	+2%	As Is			
Wt. Sample + Mold (g)	6092.6	6086.9	6068.9	6045.5	5971.9			
Wt. of Mold (g)	4245.5	4245.5	4245.5	4245.5	4245.5			
Wet Unit Wt., γ_m (pcf)	122.3	121.9	120.8	119.2	114.3			
Wet Soil + Tare (g)	722.48	636.60	623.79	729.81	633.94			
Dry Soil + Tare (g)	633.59	553.79	539.10	662.84	575.98			
Tare (g)	124.34	128.08	150.65	222.53	123.25			
Water Content, w (%)	17.5	19.5	21.8	15.2	12.8			
Dry Unit Wt., γ_d (pcf)	104.1	102.1	99.1	103.5	101.4			



Entered by: _____

Reviewed: _____

Laboratory Compaction Characteristics of Soil
 (ASTM D698 / D1557)

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Project: MWH

No: 00303-014

Location: FMC RDRA Data Gap Investigation

Date: 11/8/2013

By: ET

Method: ASTM D698 B

Mold Id. Inc 3

Mold volume (ft³): 0.0332

Boring No.: WUA-TP007-01

Sample:

Depth: 1-10'

Sample Description: Brown silt

Engineering Classification: Not requested

As-received water content (%): Not requested

Preparation method: Moist

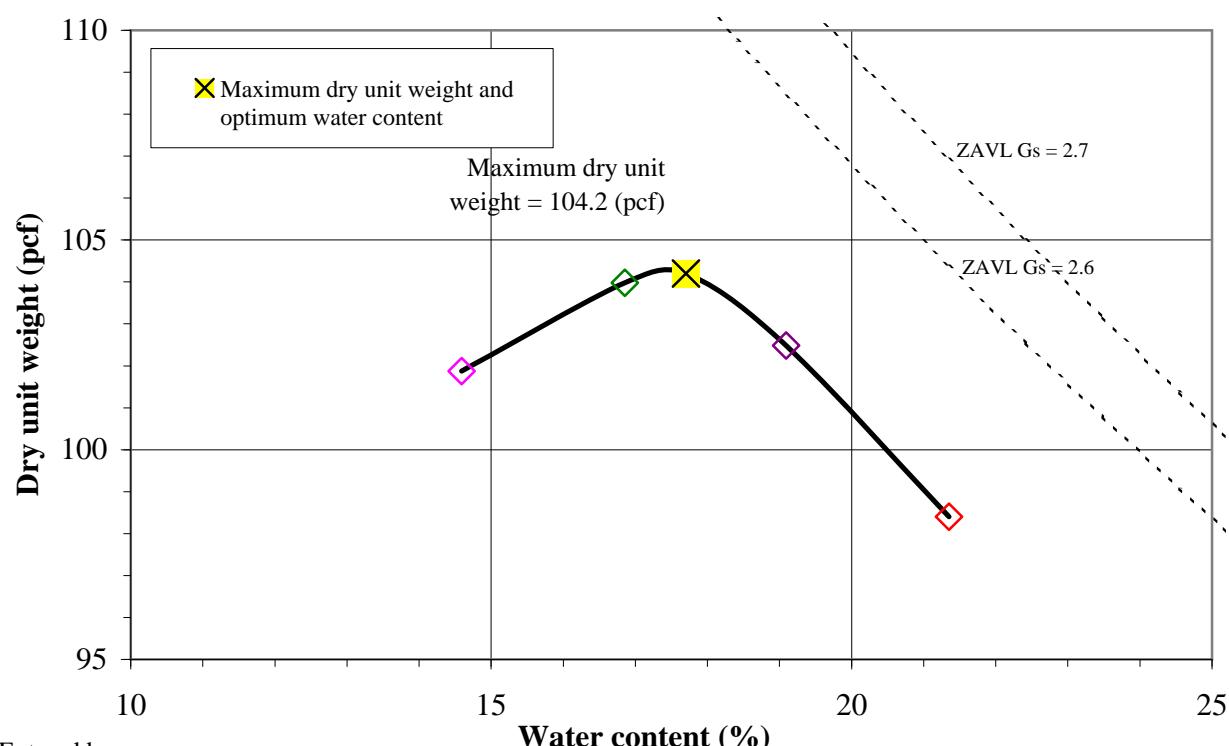
Rammer: Mechanical-circular face

Rock Correction: No

Optimum water content (%): 17.7

Maximum dry unit weight (pcf): 104.2

Point Number	+10%	+12%	+8%	+6%				
Wt. Sample + Mold (g)	6008.9	5969.1	6000.7	5928.8				
Wt. of Mold (g)	4169.7	4169.7	4169.7	4169.7				
Wet Unit Wt., γ_m (pcf)	122.1	119.4	121.5	116.7				
Wet Soil + Tare (g)	750.80	683.42	649.06	663.82				
Dry Soil + Tare (g)	664.27	594.80	573.97	595.63				
Tare (g)	210.99	179.73	128.42	128.20				
Water Content, w (%)	19.1	21.4	16.9	14.6				
Dry Unit Wt., γ_d (pcf)	102.5	98.4	104.0	101.9				



Entered by: _____

Reviewed: _____

Laboratory Compaction Characteristics of Soil
 (ASTM D698 / D1557)

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Project: MWH
No: 00303-014
Location: FMC RDRA Data Gap Investigation
Date: 11/11/2013
By: MP
Method: ASTM D698 B
Mold Id. Inc 1
Mold volume (ft³): 0.0333

Boring No.: WUA-TP008-01

Sample:

Depth: 1-10'

Sample Description: Brown silt

Engineering Classification: Not requested

As-received water content (%): Not requested

Preparation method: Moist

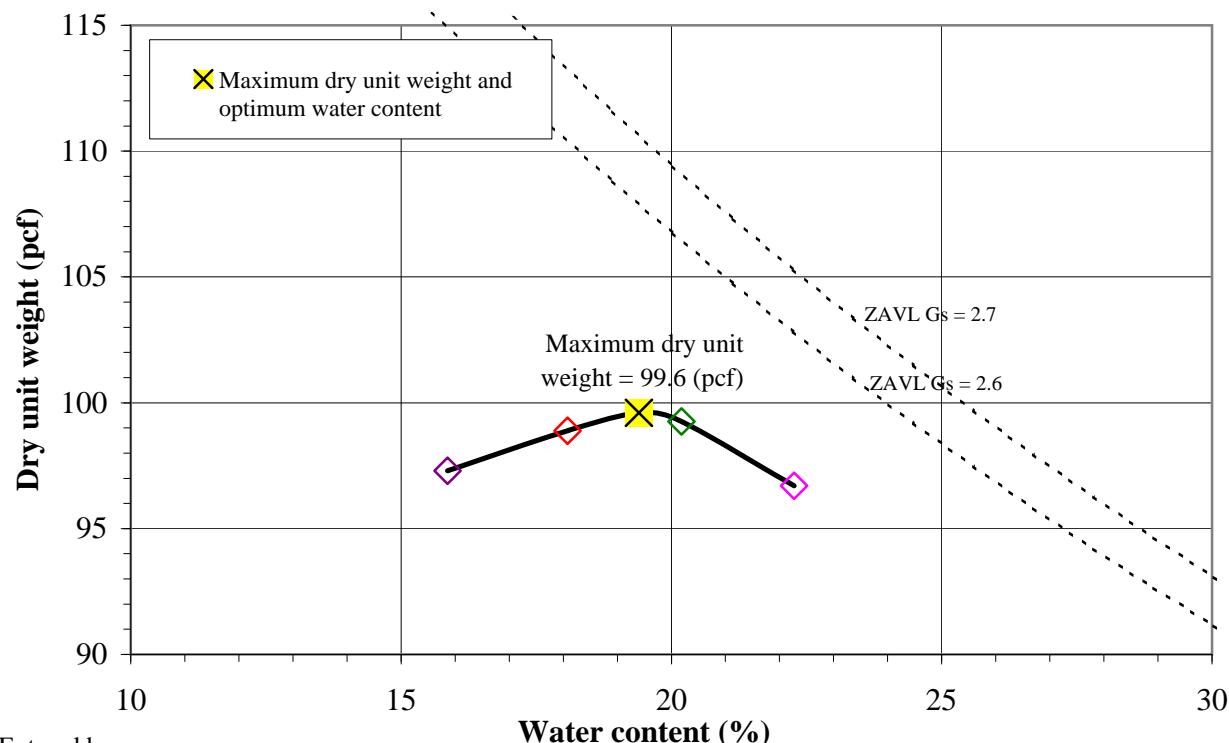
Rammer: Mechanical-circular face

Rock Correction: No

Optimum water content (%): 19.4

Maximum dry unit weight (pcf): 99.6

Point Number	+6%	+8%	+10%	+12%				
Wt. Sample + Mold (g)	5947.5	6008.6	6046.7	6030.8				
Wt. of Mold (g)	4245.4	4245.4	4245.4	4245.4				
Wet Unit Wt., γ_m (pcf)	112.7	116.8	119.3	118.2				
Wet Soil + Tare (g)	793.10	730.81	657.43	631.47				
Dry Soil + Tare (g)	702.11	637.30	567.80	538.32				
Tare (g)	128.38	120.00	123.83	120.08				
Water Content, w (%)	15.9	18.1	20.2	22.3				
Dry Unit Wt., γ_d (pcf)	97.3	98.9	99.3	96.7				



Entered by: _____

Reviewed: _____

Laboratory Compaction Characteristics of Soil
 (ASTM D698 / D1557)

 **IGES**
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Project: MWH

No: 00303-014

Location: FMC RDRA Data Gap Investigation

Date: 11/11/2013

By: MP

Method: ASTM D698 B

Mold Id. Inc 1

Mold volume (ft³): 0.0333

Boring No.: WUA-TP009-01

Sample:

Depth: 1-10'

Sample Description: Brown silty clay

Engineering Classification: Not requested

As-received water content (%): Not requested

Preparation method: Moist

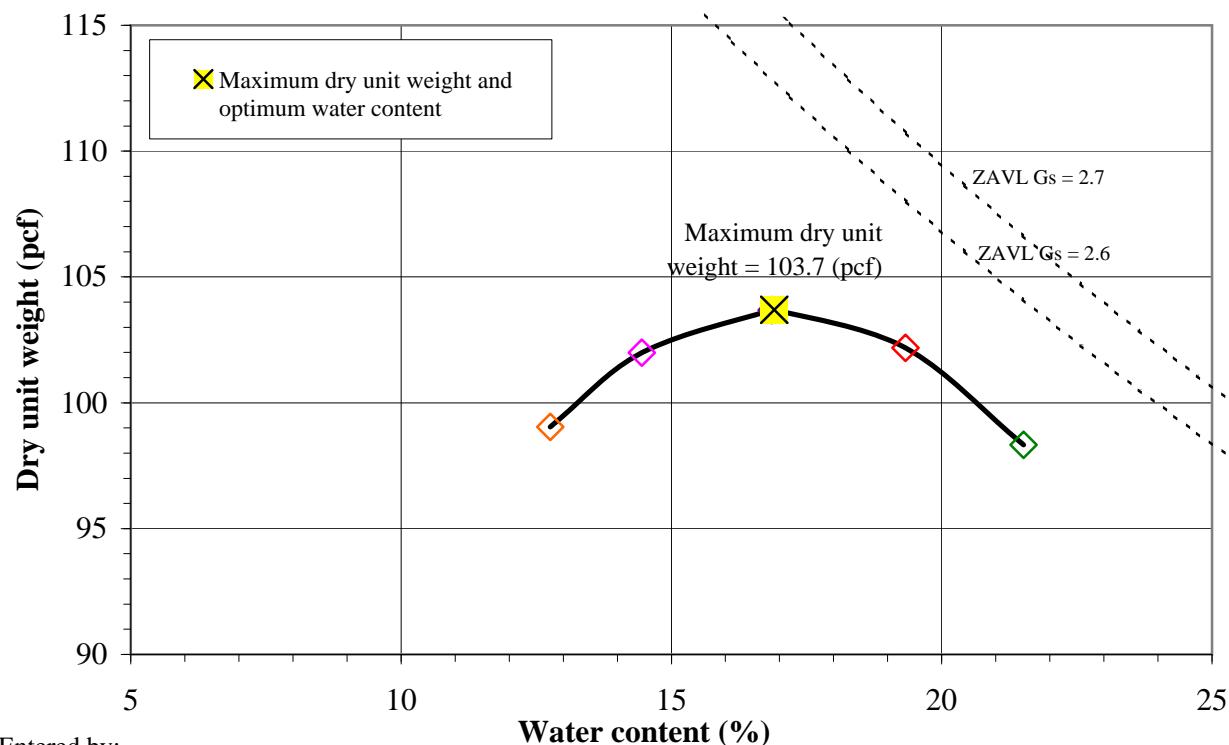
Rammer: Mechanical-circular face

Rock Correction: No

Optimum water content (%): 16.9

Maximum dry unit weight (pcf): 103.7

Point Number	+8%	+10%	+12%	+6%	+4%			
Wt. Sample + Mold (g)	6074.9	6086.5	6049.5	6008.0	5931.7			
Wt. of Mold (g)	4245.4	4245.4	4245.4	4245.4	4245.4			
Wet Unit Wt., γ_m (pcf)	121.2	121.9	119.5	116.7	111.7			
Wet Soil + Tare (g)	596.34	653.19	684.40	585.10	677.28			
Dry Soil + Tare (g)	528.63	567.41	584.85	527.23	626.00			
Tare (g)	126.90	123.67	122.09	126.80	224.06			
Water Content, w (%)	16.9	19.3	21.5	14.5	12.8			
Dry Unit Wt., γ_d (pcf)	103.7	102.2	98.3	102.0	99.0			



Entered by: _____

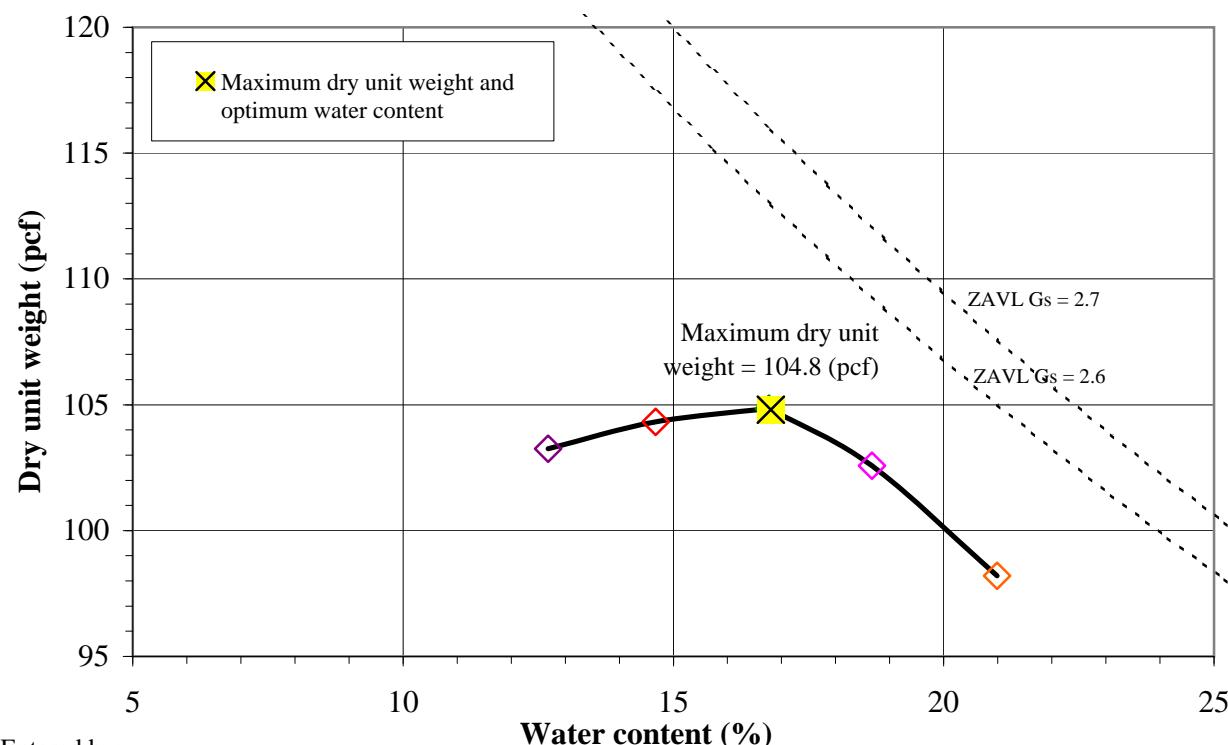
Reviewed: _____

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

 **IGES**
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Project: MWH**No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/11/2013****By: MP****Method: ASTM D698 B****Mold Id. Inc 1****Mold volume (ft³): 0.0333****Boring No.: WUA-TP010-01****Sample:****Depth: 1-10'****Sample Description: Brown silt****Engineering Classification: Not requested****As-received water content (%): Not requested****Preparation method: Moist****Rammer: Mechanical-circular face****Rock Correction: No****Optimum water content (%): 16.8****Maximum dry unit weight (pcf): 104.8**

Point Number	+6%	+8%	+10%	+12%	+14%			
Wt. Sample + Mold (g)	6002.2	6051.8	6093.8	6083.6	6039.4			
Wt. of Mold (g)	4245.4	4245.4	4245.4	4245.4	4245.4			
Wet Unit Wt., γ_m (pcf)	116.3	119.6	122.4	121.7	118.8			
Wet Soil + Tare (g)	609.52	667.87	818.15	672.08	834.00			
Dry Soil + Tare (g)	554.23	598.85	718.44	586.69	726.05			
Tare (g)	118.33	128.44	123.65	129.44	211.70			
Water Content, w (%)	12.7	14.7	16.8	18.7	21.0			
Dry Unit Wt., γ_d (pcf)	103.3	104.3	104.8	102.6	98.2			



Entered by: _____

Reviewed: _____

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible

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Wall Permeameter, Method C (ASTM D5084)**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/19/2013****By: JDF****Boring No.: WUA-TP001-01****Sample:****Depth: 1-10'**

Sample Description: Brown silty clay

Sample Type: Laboratory Compacted

Compaction Specifications: 85 (%) Dry unit weight

at 8.5 (%) w

Optimum water content (%) 17.5

Maximum dry unit weight (pcf) 106.9

Gs 2.67 Assumed

Cell No. 2

Station No. 1

Permeant liquid used De-aired tap water

Total backpressure (psi) 30

Effective horiz. consolidation stress (psi) 5

Effective vert. consolidation stress (psi) 5

	Initial (o)	Final (f)
B value	0.86	0.96
External Burette (cm ³)	8.30	16.70
Cell Pressure (psi)	0.0	35.0

Backpressure bottom (psi) 30.0

Backpressure top (psi) 30.0

System volume coefficient (cm³/psi) 0.158System volume change (cm³) 5.52Net sample volume change (cm³) -2.88Bottom burette ground length, l_b (cm) 82.00Top burette ground length, l_t (cm) 82.1Burette area, a (cm²) 0.197

Conversion, reading to cm head (cm/rd) 5.076

	Initial (o)	Final (f)
Sample Height, H (in)	3.012	3.006
Sample Diameter, D (in)	2.406	2.39
Sample Length, L (cm)	7.650	7.634
Sample Area, A (cm ²)	29.332	29.017
Sample Volume, V (cm ³)	224.41	221.52
Wt. Rings + Wet Soil (g)	354.02	423.13
Wt. Rings (g)	0	0
Wet Unit Wt., γ _m (pcf)	98.5	119.2
Wet Soil + Tare (g)	251.73	551.68
Dry Soil + Tare (g)	242.16	455.37
Tare (g)	126.81	128.2
Weight of solids, W _s (g)	326.90	326.90
Water Content, w (%)	8.30	29.44
Dry Unit Wt, γ _d (pcf)	90.9	92.1
Void ratio, e, for assumed Gs	0.83	0.79
Saturation (%), for assumed Gs	26.6	100 ^a
Average K^b (cm/sec)		3.3E-05

^a Saturation set to 100% for phase calculations^b K corrected to 20°C

Start Date and Time: 11/15/13 9:11									
Elapsed time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	h ₁ (cm)	h ₂ (cm)	K (cm/sec)	Temp (°C)	Visc. Rati ^c	R _f	K ^b (cm/sec)
1080.0	1.20	8.72							
	4.12	5.80	38.07	8.43	3.6E-05	22.4	0.94	0.94	3.4E-05
1260.0	0.38	9.62							
	4.18	5.80	46.80	8.12	3.6E-05	22.8	0.93	0.93	3.4E-05
1020.0	0.42	9.54							
	3.78	6.20	46.19	12.18	3.4E-05	21.5	0.96	0.96	3.3E-05
960.0	0.44	9.54							
	3.70	6.28	46.09	13.00	3.4E-05	21.5	0.96	0.96	3.3E-05
60.0	0.00	10.00							
	0.40	9.60	50.66	46.60	3.6E-05	22.6	0.94	0.94	3.4E-05
960.0	0.40	9.60							
	3.70	6.28	46.60	13.00	3.4E-05	22.6	0.94	0.94	3.2E-05

Entered by:_____

Reviewed:_____

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible

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Wall Permeameter, Method C (ASTM D5084)**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/19/2013****By: JDF****Boring No.: WUA-TP004-01****Sample:****Depth: 1-10'**

Sample Description: Brown silt

Sample Type: Laboratory Compacted

Compaction Specifications: 85 (%) Dry unit weight
at 9.0 (%) w

Optimum water content (%) 16.2

Maximum dry unit weight (pcf) 106.4

Gs 2.67 Assumed

Cell No. T1

Station No. 2

Permeant liquid used De-aired tap water

Total backpressure (psi) 30

Effective horiz. consolidation stress (psi) 5

Effective vert. consolidation stress (psi) 5

	Initial (o)	Final (f)
B value	0.94	0.98
External Burette (cm ³)	12.20	21.40
Cell Pressure (psi)	0.0	35.0

Backpressure bottom (psi) 30.0

Backpressure top (psi) 30.0

System volume coefficient (cm³/psi) 0.119System volume change (cm³) 4.17Net sample volume change (cm³) -5.03Bottom burette ground length, l_b (cm) 81.99Top burette ground length, l_t (cm) 81.97Burette area, a (cm²) 0.197

Conversion, reading to cm head (cm/rd) 5.076

	Initial (o)	Final (f)
Sample Height, H (in)	3.011	3.000
Sample Diameter, D (in)	2.403	2.38
Sample Length, L (cm)	7.648	7.619
Sample Area, A (cm ²)	29.259	28.709
Sample Volume, V (cm ³)	223.77	218.74
Wt. Rings + Wet Soil (g)	1111.29	423.74
Wt. Rings (g)	758.93	0
Wet Unit Wt., γ _m (pcf)	98.3	120.9
Wet Soil + Tare (g)	328.04	535.3
Dry Soil + Tare (g)	312.2	436.67
Tare (g)	139.72	121.57
Weight of solids, W _s (g)	322.72	322.72
Water Content, w (%)	9.18	31.30
Dry Unit Wt, γ _d (pcf)	90.0	92.1
Void ratio, e, for assumed Gs	0.85	0.84
Saturation (%), for assumed Gs	28.8	100 ^a
Average K^b (cm/sec)		1.4E-04
^a Saturation set to 100% for phase calculations		
^b K corrected to 20°C		

Start Date and Time: 11/18/13 8:40									
Elapsed time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	h ₁ (cm)	h ₂ (cm)	K (cm/sec)	Temp (°C)	Visc. Rati _c	R _f	K ^b (cm/sec)
60.0	0.00	10.00	50.78	35.96	1.5E-04	22.0	0.95	0.95	1.4E-04
	1.48	8.56							
240.0	1.48	8.56	35.96	9.46	1.5E-04	22.1	0.95	0.95	1.4E-04
	4.12	5.98							
60.0	0.00	10.00	50.78	36.06	1.5E-04	21.0	0.98	0.98	1.5E-04
	1.44	8.54							
240.0	1.44	8.54	36.06	9.26	1.5E-04	20.8	0.98	0.98	1.5E-04
	4.10	5.92							
60.0	0.00	10.00	50.78	36.26	1.5E-04	22.9	0.93	0.93	1.4E-04
	1.42	8.56							
240.0	1.42	8.56	36.26	9.16	1.5E-04	21.9	0.95	0.95	1.4E-04
	4.10	5.90							

Entered by:_____

Reviewed:_____

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible

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Wall Permeameter, Method C (ASTM D5084)**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/19/2013****By: JDF****Boring No.: WUA-TP006-01****Sample:****Depth: 1-10'**

Sample Description: Brown silty clay

Sample Type: Laboratory Compacted

Compaction Specifications: 85 (%) Dry unit weight

at 8.5 (%) w

Optimum water content (%) 16.8

Maximum dry unit weight (pcf) 104.4

Gs 2.67 Assumed

Cell No. T2

Station No. 3

Permeant liquid used De-aired tap water

Total backpressure (psi) 30

Effective horiz. consolidation stress (psi) 5

Effective vert. consolidation stress (psi) 5

	Initial (o)	Final (f)
B value	0.88	0.96
External Burette (cm ³)	10.50	22.40
Cell Pressure (psi)	0.0	35.0

Backpressure bottom (psi) 30.0

Backpressure top (psi) 30.0

System volume coefficient (cm³/psi) 0.108System volume change (cm³) 3.79Net sample volume change (cm³) -8.11Bottom burette ground length, l_b (cm) 82.10Top burette ground length, l_t (cm) 81.9Burette area, a (cm²) 0.197

Conversion, reading to cm head (cm/rd) 5.076

	Initial (o)	Final (f)
Sample Height, H (in)	3.014	2.996
Sample Diameter, D (in)	2.401	2.36
Sample Length, L (cm)	7.656	7.610
Sample Area, A (cm ²)	29.211	28.322
Sample Volume, V (cm ³)	223.62	215.51
Wt. Rings + Wet Soil (g)	346.12	411.81
Wt. Rings (g)	0	0
Wet Unit Wt., γ _m (pcf)	96.6	119.3
Wet Soil + Tare (g)	304.54	534.21
Dry Soil + Tare (g)	289.91	440.58
Tare (g)	123.34	122.43
Weight of solids, W _s (g)	318.17	318.17
Water Content, w (%)	8.78	29.43
Dry Unit Wt, γ _d (pcf)	88.8	92.2
Void ratio, e, for assumed Gs	0.88	0.79
Saturation (%), for assumed Gs	26.8	100 ^a
Average K^b (cm/sec)		2.3E-05
^a Saturation set to 100% for phase calculations		
^b K corrected to 20°C		

Start Date and Time: 11/15/13 9:12									
Elapsed time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	h ₁ (cm)	h ₂ (cm)	K (cm/sec)	Temp (°C)	Visc. Rati _c	R _f	K ^b (cm/sec)
180.0	0.00	10.00	50.96	43.04	2.5E-05	22.2	0.95	0.95	2.4E-05
	0.76	9.20							
1080.0	0.76	9.20	43.04	16.04	2.4E-05	21.8	0.96	0.96	2.3E-05
	3.42	6.54							
600.0	3.42	6.54	16.04	9.13	2.5E-05	21.2	0.97	0.97	2.4E-05
	4.10	5.86							
60.0	0.00	10.00	50.96	48.42	2.3E-05	22.1	0.95	0.95	2.1E-05
	0.28	9.78							
1320.0	0.28	9.78	48.42	15.33	2.3E-05	22.5	0.94	0.94	2.2E-05
	3.56	6.54							
60.0	0.00	10.00	50.96	48.22	2.4E-05	21.0	0.98	0.98	2.4E-05
	0.26	9.72							
900.0	0.26	9.72	48.22	21.82	2.3E-05	22.0	0.95	0.95	2.2E-05
	2.86	7.12							

Entered by:_____

Reviewed:_____

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible

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Wall Permeameter, Method C (ASTM D5084)**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/19/2013****By: JDF****Boring No.: WUA-TP007-01****Sample:****Depth: 1-10'**

Sample Description: Brown silt

Sample Type: Laboratory Compacted

Compaction Specifications: 85 (%) Dry unit weight

at 8.5 (%) w

Optimum water content (%) 17.7

Maximum dry unit weight (pcf) 104.2

Gs 2.65 Assumed

Cell No. T3

Station No. 4

Permeant liquid used De-aired tap water

Total backpressure (psi) 30

Effective horiz. consolidation stress (psi) 5

Effective vert. consolidation stress (psi) 5

	Initial (o)	Final (f)
B value	0.84	1.00
External Burette (cm ³)	7.30	17.10
Cell Pressure (psi)	0.0	35.0

Backpressure bottom (psi) 30.0

Backpressure top (psi) 30.0

System volume coefficient (cm³/psi) 0.105System volume change (cm³) 3.69Net sample volume change (cm³) -6.11Bottom burette ground length, l_b (cm) 81.90Top burette ground length, l_t (cm) 81.98Burette area, a (cm²) 0.197

Conversion, reading to cm head (cm/rd) 5.076

	Initial (o)	Final (f)
Sample Height, H (in)	3.007	2.993
Sample Diameter, D (in)	2.409	2.38
Sample Length, L (cm)	7.638	7.603
Sample Area, A (cm ²)	29.406	28.735
Sample Volume, V (cm ³)	224.59	218.48
Wt. Rings + Wet Soil (g)	345.51	418.30
Wt. Rings (g)	0	0
Wet Unit Wt., γ _m (pcf)	96.0	119.5
Wet Soil + Tare (g)	304.93	545.67
Dry Soil + Tare (g)	291.11	446.57
Tare (g)	123	127.09
Weight of solids, W _s (g)	319.26	319.26
Water Content, w (%)	8.22	31.02
Dry Unit Wt, γ _d (pcf)	88.7	91.2
Void ratio, e, for assumed Gs	0.86	0.82
Saturation (%), for assumed Gs	25.2	100 ^a
Average K^b (cm/sec)		5.8E-05
^a Saturation set to 100% for phase calculations		
^b K corrected to 20°C		

Start Date and Time: 11/15/13 9:34									
Elapsed time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	h ₁ (cm)	h ₂ (cm)	K (cm/sec)	Temp (°C)	Visc. Rati _c	R _f	K ^b (cm/sec)
600.0	0.90 3.96	9.14 6.12	41.75	10.88	5.8E-05	21.6	0.96	0.96	5.6E-05
660.0	0.80 4.04	9.20 6.00	42.56	9.87	5.8E-05	22.5	0.94	0.94	5.4E-05
60.0	0.00 0.70	10.00 9.30	50.68	43.57	6.6E-05	22.5	0.94	0.94	6.2E-05
600.0	0.70 3.94	9.30 6.04	43.57	10.58	6.1E-05	22.5	0.94	0.94	5.8E-05
60.0	0.00 0.72	10.00 9.38	50.68	43.88	6.3E-05	22.6	0.94	0.94	5.9E-05
600.0	0.72 4.00	9.38 5.90	43.88	9.56	6.6E-05	22.6	0.94	0.94	6.2E-05

Entered by:_____

Reviewed:_____

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible

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Wall Permeameter, Method C (ASTM D5084)**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 11/19/2013****By: JDF****Boring No.: WUA-TP008-01****Sample:****Depth: 1-10'**

Sample Description: Brown silt

Sample Type: Laboratory Compacted

Compaction Specifications: 85 (%) Dry unit weight

at 8.5 (%) w

Optimum water content (%) 19.4

Maximum dry unit weight (pcf) 99.6

Gs 2.65 Assumed

Cell No. 3

Station No. 5

Permeant liquid used De-aired tap water

Total backpressure (psi) 30

Effective horiz. consolidation stress (psi) 5

Effective vert. consolidation stress (psi) 5

	Initial (o)	Final (f)
B value	0.86	0.98
External Burette (cm ³)	12.60	23.20
Cell Pressure (psi)	0.0	35.0

Backpressure bottom (psi) 30.0

Backpressure top (psi) 30.0

System volume coefficient (cm³/psi) 0.151System volume change (cm³) 5.29Net sample volume change (cm³) -5.31Bottom burette ground length, l_b (cm) 81.85Top burette ground length, l_t (cm) 81.9Burette area, a (cm²) 0.197

Conversion, reading to cm head (cm/rd) 5.076

	Initial (o)	Final (f)
Sample Height, H (in)	3.010	2.998
Sample Diameter, D (in)	2.405	2.38
Sample Length, L (cm)	7.645	7.615
Sample Area, A (cm ²)	29.308	28.727
Sample Volume, V (cm ³)	224.07	218.77
Wt. Rings + Wet Soil (g)	330.21	410.65
Wt. Rings (g)	0	0
Wet Unit Wt., γ _m (pcf)	92.0	117.2
Wet Soil + Tare (g)	379.66	536.54
Dry Soil + Tare (g)	360.76	430.39
Tare (g)	140.47	127.37
Weight of solids, W _s (g)	304.12	304.12
Water Content, w (%)	8.58	35.03
Dry Unit Wt, γ _d (pcf)	84.7	86.8
Void ratio, e, for assumed Gs	0.95	0.93
Saturation (%), for assumed Gs	23.9	100 ^a
Average K^b (cm/sec)		7.8E-05
^a Saturation set to 100% for phase calculations		
^b K corrected to 20°C		

Start Date and Time: 11/15/13 9:35								
Elapsed time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	h ₁ (cm)	h ₂ (cm)	K (cm/sec)	Temp (°C)	Visc. Rati _c	K ^b (cm/sec)
420.0	1.68	8.30						
	4.12	5.84	33.55	8.68	8.4E-05	21.0	0.98	8.2E-05
480.0	0.96	9.06						
	4.10	5.94	41.07	9.29	8.1E-05	22.1	0.95	7.7E-05
480.0	0.92	9.08						
	4.06	5.96	41.37	9.59	7.9E-05	21.2	0.97	7.7E-05
480.0	0.92	9.06						
	4.05	5.94	41.27	9.54	8.0E-05	21.0	0.98	7.8E-05

Entered by:_____

Reviewed:_____

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter,**Method C (ASTM D5084)****Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 12/2/2013****By: JDF**

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Boring No.: SB-7**Sample:****Depth: 6-8'**

Sample Description: light brown silt

Sample Type: Undisturbed

	Initial (o)	Final (f)
Sample Height, H (in)	2.770	2.767
Sample Diameter, D (in)	2.884	2.88
Sample Length, L (cm)	7.036	7.027
Sample Area, A (cm ²)	42.145	41.907
Sample Volume, V (cm ³)	296.52	294.49
Wt. Rings + Wet Soil (g)	628.36	571.21
Wt. Rings (g)	152.04	0
Wet Unit Wt., γ_m (pcf)	100.3	121.1
Wet Soil + Tare (g)	296.8	689.62
Dry Soil + Tare (g)	287.4	568.94
Tare (g)	128.47	122.22
Weight of solids, Ws (g)	449.72	449.72
Water Content, w (%)	5.91	27.01
Dry Unit Wt, γ_d (pcf)	94.7	95.3
Void ratio, e, for assumed Gs	0.75	0.72
Saturation (%), for assumed Gs	21.0	100 ^a
Average K^b (cm/sec)		6.2E-05
^a Saturation set to 100% for phase calculations		
^b K corrected to 20°C		

Gs	2.65	Assumed
Cell No.	1	
Station No.	1	
Permeant liquid used	De-aired tap water	
Total backpressure (psi)	49.5	
Effective horiz. consolidation stress (psi)	5	
Effective vert. consolidation stress (psi)	5	
Initial (o) Final (f)		
B value	0.54	0.96
External Burette (cm ³)	9.90	20.10
Cell Pressure (psi)	0.0	54.5
Backpressure bottom (psi)	49.5	
Backpressure top (psi)	49.5	
System volume coefficient (cm ³ /psi)	0.150	
System volume change (cm ³)	8.16	
Net sample volume change (cm ³)	-2.04	
Bottom burette ground length, l _b (cm)	82.00	
Top burette ground length, l _t (cm)	82.1	
Burette area, a (cm ²)	0.197	
Conversion, reading to cm head (cm/rd)	5.076	

Start Date and Time: 11/27/13 12:26									
Elapsed time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	h ₁ (cm)	h ₂ (cm)	K (cm/sec)	Temp (°C)	Visc. Rati ^c	R _f	K ^b (cm/sec)
180.0	0.00 2.56	10.00 7.42	50.66	24.57	6.6E-05	23.6	0.92	0.92	6.1E-05
180.0	0.00 2.58	10.00 7.42	50.66	24.47	6.7E-05	23.6	0.92	0.92	6.1E-05
180.0	0.00 2.64	10.00 7.35	50.66	23.81	6.9E-05	23.6	0.92	0.92	6.4E-05
180.0	0.00 2.64	10.00 7.35	50.66	23.81	6.9E-05	23.6	0.92	0.92	6.4E-05

Entered by:_____

Reviewed:_____

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter,**Method C (ASTM D5084)****Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 12/16/2013****By: JDF**

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Boring No.: SB7**Sample:****Depth: 12-14'**

Sample Description: Light brown silt

Sample Type: Undisturbed

	Initial (o)	Final (f)
Sample Height, H (in)	4.443	4.429
Sample Diameter, D (in)	2.798	2.76
Sample Length, L (cm)	11.285	11.249
Sample Area, A (cm ²)	39.669	38.653
Sample Volume, V (cm ³)	447.67	434.79
Wt. Rings + Wet Soil (g)	800.26	811.17
Wt. Rings (g)	168.6	0
Wet Unit Wt., γ_m (pcf)	88.1	116.5
Wet Soil + Tare (g)	405.17	1098.2
Dry Soil + Tare (g)	389.85	890.05
Tare (g)	128.62	311.06
Weight of solids, Ws (g)	596.67	596.67
Water Content, w (%)	5.86	35.95
Dry Unit Wt, γ_d (pcf)	83.2	85.7
Void ratio, e, for assumed Gs	0.99	0.95
Saturation (%), for assumed Gs	15.7	100 ^a
Average K^b (cm/sec)		3.1E-04
^a Saturation set to 100% for phase calculations		
^b K corrected to 20°C		

Gs	2.65	Assumed
Cell No.	H1	
Station No.	1	
Permeant liquid used	De-aired tap water	
Total backpressure (psi)	35	
Effective horiz. consolidation stress (psi)	5	
Effective vert. consolidation stress (psi)	5	
Initial (o) Final (f)		
B value	0.56	0.98
External Burette (cm ³)	8.80	29.90
Cell Pressure (psi)	0.0	40.0
Backpressure bottom (psi)	35.0	
Backpressure top (psi)	35.0	
System volume coefficient (cm ³ /psi)	0.205	
System volume change (cm ³)	8.22	
Net sample volume change (cm ³)	-12.88	
Bottom burette ground length, l _b (cm)	82.00	
Top burette ground length, l _t (cm)	82.1	
Burette area, a (cm ²)	0.197	
Conversion, reading to cm head (cm/rd)	5.076	

Start Date and Time: 12/13/13 7:24								
Elapsed time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	h ₁ (cm)	h ₂ (cm)	K (cm/sec)	Temp (°C)	Visc. Rati ^c	K ^b (cm/sec)
180.0	0.00 4.32	10.00 5.64	50.66	6.60	3.2E-04	21.8	0.96	3.1E-04
180.0	0.00 4.32	10.00 5.66	50.66	6.70	3.2E-04	21.7	0.96	3.1E-04
180.0	0.00 4.34	10.00 5.66	50.66	6.60	3.2E-04	22.6	0.94	3.0E-04
180.0	0.00 4.36	10.00 5.64	50.66	6.40	3.3E-04	23.1	0.93	3.1E-04

Entered by:_____

Reviewed:_____

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible**Wall Permeameter,** Method C (ASTM D5084)**Project: MWH****No: 00303-014****Location: FMC RDRA Data Gap Investigation****Date: 12/17/2013****By: NB/JDF**

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Boring No.: SB3**Sample:****Depth:**

Sample Description: Light brown silt with gravel and sand

Sample Type: Remolded

Compaction Specifications: 105.4 pcf
at 0 (%) w

	Initial (o)	Final (f)
Sample Height, H (in)	2.471	2.436
Sample Diameter, D (in)	2.387	2.32
Sample Length, L (cm)	6.276	6.188
Sample Area, A (cm^2)	28.871	27.253
Sample Volume, V (cm^3)	181.20	168.65
Wt. Rings + Wet Soil (g)	305.97	362.76
Wt. Rings (g)	0	0
Wet Unit Wt., γ_m (pcf)	105.4	134.3
Wet Soil + Tare (g)	1	489.34
Dry Soil + Tare (g)	1	432.79
Tare (g)	0	128.09
Weight of solids, Ws (g)	305.97	305.97
Water Content, w (%)	0.00	18.56
Dry Unit Wt, γ_d (pcf)	105.4	113.3
Void ratio, e, for assumed Gs	0.57	0.49
Saturation (%), for assumed Gs	0.0	100 ^a
Average K^b (cm/sec)		2.6E-06
^a Saturation set to 100% for phase calculations		
^b K corrected to 20°C		

Gs	2.65	Assumed
Cell No.	3	
Station No.	3	
Permeant liquid used	De-aired tap water	
Total backpressure (psi)	30	
Effective horiz. consolidation stress (psi)	11.3	
Effective vert. consolidation stress (psi)	11.3	
Initial (o) Final (f)		
B value	0.98	1.00
External Burette (cm ³)	14.50	33.30
Cell Pressure (psi)	0.0	41.3
Backpressure bottom (psi)	30.0	
Backpressure top (psi)	30.0	
System volume coefficient (cm ³ /psi)	0.151	
System volume change (cm ³)	6.25	
Net sample volume change (cm ³)	-12.55	
Bottom burette ground length, l _b (cm)	82.10	
Top burette ground length, l _t (cm)	81.9	
Burette area, a (cm ²)	0.197	
Conversion, reading to cm head (cm/rd)	5.076	

Start Date and Time: 12/16/13 8:32									
Elapsed time (sec)	Bottom Burette (cm ³)	Top Burette (cm ³)	h ₁ (cm)	h ₂ (cm)	K (cm/sec)	Temp (°C)	Visc. Rati ^c	R _f	K ^b (cm/sec)
1620.0	0.00	10.00	50.96	41.22	2.9E-06	22.8	0.93	0.93	2.7E-06
	0.94	9.02							
5160.0	0.94	9.02	41.22	21.93	2.7E-06	21.9	0.95	0.95	2.6E-06
	2.84	7.12							
3600.0	2.84	7.12	21.93	14.11	2.7E-06	22.3	0.95	0.95	2.6E-06
	3.62	6.36							
4560.0	3.62	6.36	14.11	8.22	2.6E-06	22.4	0.94	0.94	2.5E-06
	4.20	5.78							
1680.0	4.20	5.78	8.22	6.80	2.5E-06	22.5	0.94	0.94	2.4E-06
	4.34	5.64							
960.0	0.00	10.00	50.96	45.58	2.6E-06	22.5	0.94	0.94	2.4E-06
	0.48	9.42							
5940.0	0.48	9.42	45.58	21.82	2.8E-06	22.7	0.94	0.94	2.6E-06
	2.86	7.12							

Entered by:_____

Reviewed:_____

Determination of the Soil Water Characteristic Curve for Desorption

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Using Pressure Extractor

(In general accordance with ASTM D6836)

Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

Date: 1/15/2014

By: NB/MP

Specific gravity, Gs: 2.650 Assumed

Boring No.: WUA-TP001-01**Sample:****Depth: 1-10'**

Description: Brown silty clay

Sample type: Laboratory compacted

Dry unit weight 90.9 pcf

at 8.5 (%) w

Compaction specifications: 85% of

ASTM D698B

		Test No.	1	2	3	4	5	6	7*	8*
		Tension (psi)	0.5	1.0	2.0	6.0	18.0	72.0	1235.72	11655.23
Sample A	Initial Condition	Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035	0.1897	0.1872
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416	1.4720	1.4720
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001	0.0002	0.0002
		Wt. rings/cup + wet soil (g)	102.97	102.97	102.97	102.97	102.97	102.97	32.838	32.448
		Wt. rings/cup (g)	43.33	43.33	43.33	43.33	43.33	43.33	24.598	24.578
		Moist soil, Ws (g)	59.64	59.64	59.64	59.64	59.64	59.64	8.240	7.870
		Dry soil (g)	55.07	55.07	55.07	55.07	55.07	55.07	7.683	7.587
		Moist unit wt., γ_m (pcf)	98.43	98.43	98.43	98.43	98.43	98.43	97.24	94.11
		Wet soil + tare (g)	251.73	251.73	251.73	251.73	251.73	251.73	32.838	32.448
		Dry soil + tare (g)	242.16	242.16	242.16	242.16	242.16	242.16	32.281	32.165
		Tare (g)	126.81	126.81	126.81	126.81	126.81	126.81	24.598	24.578
		Moisture Content, w (%)	8.3	8.3	8.3	8.3	8.3	8.3	7.25	3.73
		Dry Unit Wt., γ_d (pcf)	90.89	90.89	90.89	90.89	90.89	90.89	90.66	90.73
		Wet soil + ring/cup (g)	116.74	115.88	114.20	109.96	107.35	105.41	32.831	32.445
Sample B	Final Condition	Dry soil + ring/cup (g)	98.40	98.40	98.40	98.40	98.40	98.40	32.281	32.165
		Ring/cup (g)	43.33	43.33	43.33	43.33	43.33	43.33	24.598	24.578
		Dry soil (g)	55.07	55.07	55.07	55.07	55.07	55.07	7.683	7.587
		Moisture Content, w (%)	33.30	31.74	28.69	20.99	16.25	12.73	7.16	3.69
		Volumetric Water Content, θ	0.485	0.462	0.418	0.306	0.237	0.185	0.104	0.054
		Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035		
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416		
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001		
		Wt. rings/cup + wet soil (g)	102.40	102.40	102.40	102.40	102.40	102.40		
		Wt. rings/cup (g)	42.60	42.60	42.60	42.60	42.60	42.60		
		Moist unit wt., γ_m (pcf)	98.70	98.70	98.70	98.70	98.70	98.70		
		Wet soil + tare (g)	251.73	251.73	251.73	251.73	251.73	251.73		
		Dry soil + tare (g)	242.16	242.16	242.16	242.16	242.16	242.16		
		Tare (g)	126.81	126.81	126.81	126.81	126.81	126.81		
		Moisture Content, w (%)	8.3	8.3	8.3	8.3	8.3	8.3		
		Dry Unit Wt., γ_d (pcf)	91.13	91.13	91.13	91.13	91.13	91.13		
		Wet soil + ring/cup (g)	116.01	114.81	113.80	109.78	107.12	105.19		
		Dry soil + ring/cup (g)	97.82	97.82	97.82	97.82	97.82	97.82		
		Ring/cup (g)	42.60	42.60	42.60	42.60	42.60	42.60		
		Dry soil (g)	55.22	55.22	55.22	55.22	55.22	55.22		
		Moisture Content, w (%)	32.94	30.77	28.94	21.66	16.84	13.35		
		Volumetric Water Content, θ	0.481	0.449	0.423	0.316	0.246	0.195		
		Average Volumetric Moisture:	0.483	0.456	0.420	0.311	0.241	0.190	0.104	0.054

Comments:

*Points 7 and 8 were performed on a Chilled Mirror Hygrometer

Entered by:_____

Reviewed:_____

Determination of the Soil Water Characteristic Curve for Desorption**Using Pressure Extractor**

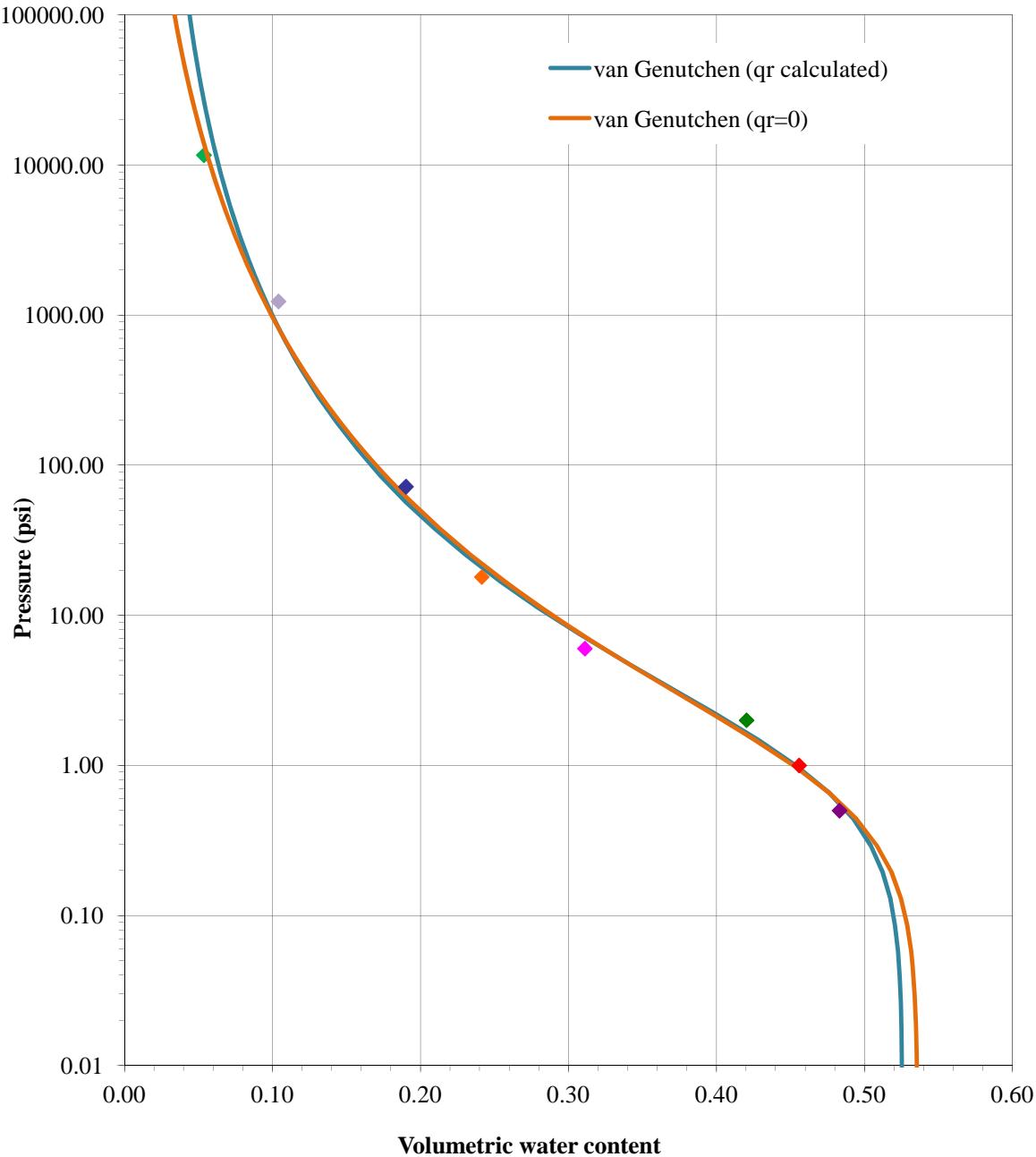
(In general accordance with ASTM D6836)



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Project: MWH
No: 00303-014
Location: FMC RDRA Data Gap Investigation
Date: 1/15/2014

Boring No.: WUA-TP001-01
Sample:
Depth: 1-10'
Description: Brown silty clay



van Genuchten fitting parameters (using SWRC fit, Seki, K. (2007)):

θ_r calculated	Setting $\theta_r = 0$
θ_s	0.5257
θ_r	0.0207
α	1.0624
n	1.2659
m	0.2100
R^2	0.9963
θ_s	0.5358
θ_r	0
α	1.3558
n	1.2337
m	0.1894
R^2	0.9960

Determination of the Soil Water Characteristic Curve for Desorption

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Using Pressure Extractor

(In general accordance with ASTM D6836)

Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

Date: 1/15/2014

By: NB/MP

Specific gravity, Gs: 2.650 Assumed

Boring No.: WUA-TP004-01**Sample:****Depth: 1-10'**

Description: Brown silt

Sample type: Laboratory compacted

Dry unit weight 90.4 pcf

at 9 (%) w

Compaction specifications: 85% of

ASTM D698B

		Test No.	1	2	3	4	5	6	7*	8*
		Tension (psi)	0.5	1.0	2.0	6.0	18.0	72.0	929.69	11344.85
Sample A	Initial Condition	Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035	0.1897	0.1883
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416	1.4717	1.4718
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001	0.0002	0.0002
		Wt. rings/cup + wet soil (g)	102.56	102.56	102.56	102.56	102.56	102.56	32.694	32.139
		Wt. rings/cup (g)	42.68	42.68	42.68	42.68	42.68	42.68	24.766	24.371
		Moist soil, Ws (g)	59.88	59.88	59.88	59.88	59.88	59.88	7.928	7.768
		Dry soil (g)	54.84	54.84	54.84	54.84	54.84	54.84	7.594	7.602
		Moist unit wt., γ_m (pcf)	98.83	98.83	98.83	98.83	98.83	98.83	93.60	92.37
		Wet soil + tare (g)	328.04	328.04	328.04	328.04	328.04	328.04	32.694	32.139
		Dry soil + tare (g)	312.20	312.20	312.20	312.20	312.20	312.20	32.360	31.973
	Final Condition	Tare (g)	139.72	139.72	139.72	139.72	139.72	139.72	24.766	24.371
		Moisture Content, w (%)	9.2	9.2	9.2	9.2	9.2	9.2	4.40	2.18
		Dry Unit Wt., γ_d (pcf)	90.51	90.51	90.51	90.51	90.51	90.51	89.65	90.40
		Wet soil + ring/cup (g)	114.28	113.48	112.54	110.27	103.80	101.73	32.683	32.137
		Dry soil + ring/cup (g)	97.52	97.52	97.52	97.52	97.52	97.52	32.360	31.973
	Sample B	Ring/cup (g)	42.68	42.68	42.68	42.68	42.68	42.68	24.766	24.371
		Dry soil (g)	54.84	54.84	54.84	54.84	54.84	54.84	7.594	7.602
		Moisture Content, w (%)	30.55	29.09	27.38	23.24	11.44	7.67	4.25	2.16
		Volumetric Water Content, θ	0.443	0.422	0.397	0.337	0.166	0.111	0.061	0.031
		Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035		
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416		
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001		
		Wt. rings/cup + wet soil (g)	102.75	102.75	102.75	102.75	102.75	102.75		
		Wt. rings/cup (g)	42.84	42.84	42.84	42.84	42.84	42.84		
		Moist unit wt., γ_m (pcf)	98.88	98.88	98.88	98.88	98.88	98.88		
	Initial Condition	Wet soil + tare (g)	328.04	328.04	328.04	328.04	328.04	328.04		
		Dry soil + tare (g)	312.20	312.20	312.20	312.20	312.20	312.20		
		Tare (g)	139.72	139.72	139.72	139.72	139.72	139.72		
		Moisture Content, w (%)	9.2	9.2	9.2	9.2	9.2	9.2		
		Dry Unit Wt., γ_d (pcf)	90.56	90.56	90.56	90.56	90.56	90.56		
		Wet soil + ring/cup (g)	114.69	113.81	112.65	109.02	103.31	101.57		
		Dry soil + ring/cup (g)	97.71	97.71	97.71	97.71	97.71	97.71		
		Ring/cup (g)	42.84	42.84	42.84	42.84	42.84	42.84		
		Dry soil (g)	54.87	54.87	54.87	54.87	54.87	54.87		
		Moisture Content, w (%)	30.94	29.34	27.23	20.61	10.20	7.03		
	Final Condition	Volumetric Water Content, θ	0.449	0.426	0.395	0.299	0.148	0.102		
		Average Volumetric Moisture:	0.446	0.424	0.396	0.318	0.157	0.107	0.061	0.031

Comments:

*Points 7 and 8 were performed on a Chilled Mirror Hygrometer

Entered by:_____

Reviewed:_____

Determination of the Soil Water Characteristic Curve for Desorption**Using Pressure Extractor**

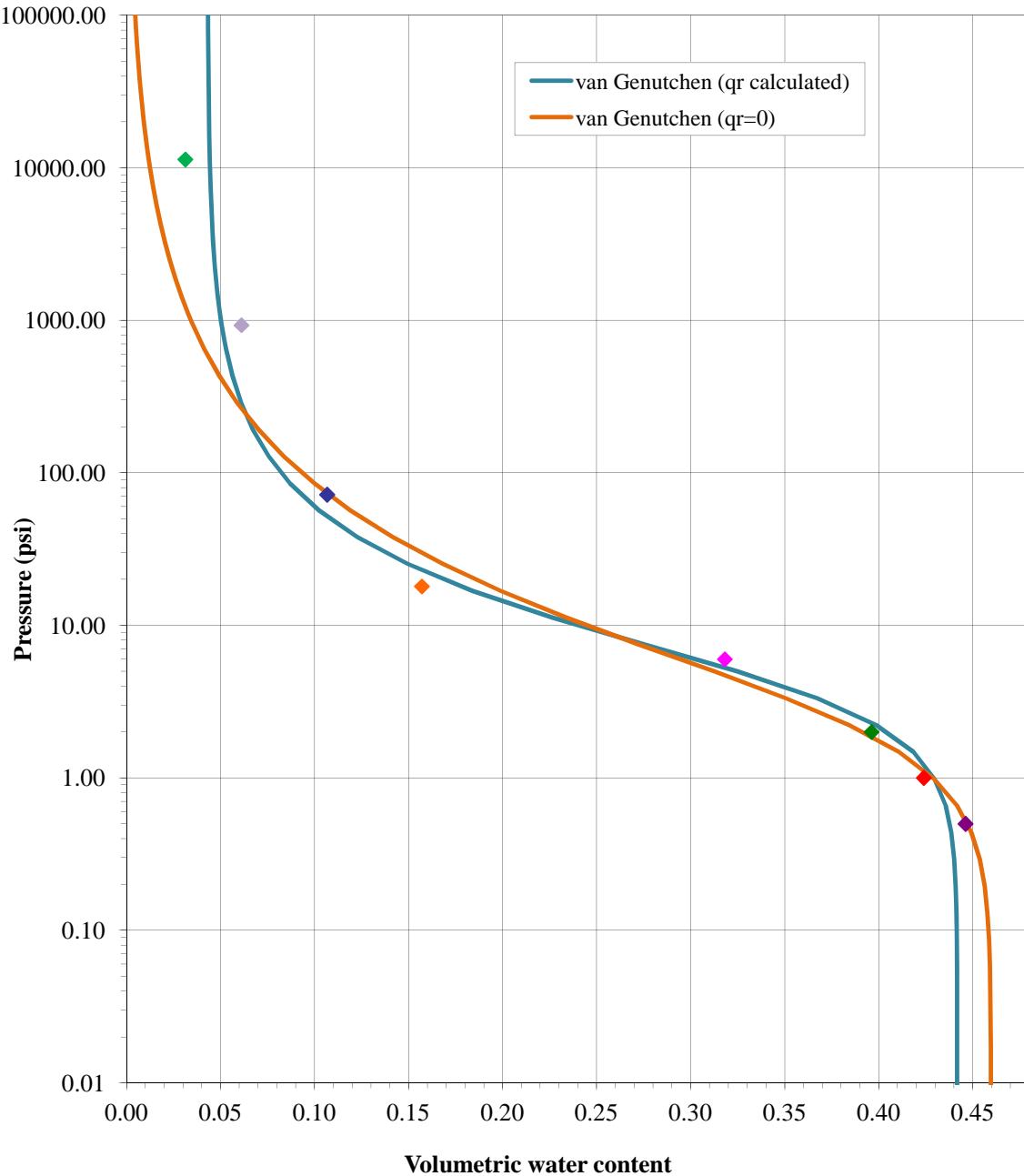
(In general accordance with ASTM D6836)



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Project: MWH
No: 00303-014
Location: FMC RDRA Data Gap Investigation
Date: 1/15/2014

Boring No.: WUA-TP004-01
Sample:
Depth: 1-10'
Description: Brown silt



van Genuchten fitting parameters (using SWRC fit, Seki, K. (2007)):

 θ_r calculated

θ_s	0.4417	θ_s	0.4597
θ_r	0.0431	θ_r	0
α	0.2293	α	0.3874
n	1.7409	n	1.4358
m	0.4256	m	0.3035
R ²	0.9963	R ²	0.9872

Determination of the Soil Water Characteristic Curve for Desorption**Using Pressure Extractor**

(In general accordance with ASTM D6836)

Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

Date: 1/15/2014

By: NB/MP

Specific gravity, Gs: 2.650 Assumed

Boring No.: WUA-TP006-01**Sample:****Depth: 1-10'**

Description: Brown silty clay

Sample type: Laboratory compacted

Dry unit weight 88.7 pcf

at 8.5 (%) w

Compaction specifications: 85% of

ASTM D698B

		Test No.	1	2	3	4	5	6	7*	8*
		Tension (psi)	0.5	1.0	2.0	6.0	18.0	72.0	462.67	6381.66
Sample A	Initial Condition	Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035	0.1883	0.1875
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416	1.4715	1.4725
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001	0.0002	0.0002
		Wt. rings/cup + wet soil (g)	101.62	101.62	101.62	101.62	101.62	101.62	32.585	32.480
		Wt. rings/cup (g)	43.06	43.06	43.06	43.06	43.06	43.06	24.595	24.774
		Moist soil, Ws (g)	58.56	58.56	58.56	58.56	58.56	58.56	7.990	7.706
		Dry soil (g)	53.83	53.83	53.83	53.83	53.83	53.83	7.446	7.429
		Moist unit wt., γ_m (pcf)	96.65	96.65	96.65	96.65	96.65	96.65	95.05	91.94
		Wet soil + tare (g)	304.54	304.54	304.54	304.54	304.54	304.54	32.585	32.480
	Final Condition	Dry soil + tare (g)	289.91	289.91	289.91	289.91	289.91	289.91	32.041	32.203
		Tare (g)	123.34	123.34	123.34	123.34	123.34	123.34	24.595	24.774
		Moisture Content, w (%)	8.8	8.8	8.8	8.8	8.8	8.8	7.31	3.73
		Dry Unit Wt., γ_d (pcf)	88.85	88.85	88.85	88.85	88.85	88.85	88.58	88.64
		Wet soil + ring/cup (g)	114.15	113.24	112.02	109.13	105.67	103.28	32.578	32.478
		Dry soil + ring/cup (g)	96.89	96.89	96.89	96.89	96.89	96.89	32.041	32.203
		Ring/cup (g)	43.06	43.06	43.06	43.06	43.06	43.06	24.595	24.774
		Dry soil (g)	53.83	53.83	53.83	53.83	53.83	53.83	7.446	7.429
		Moisture Content, w (%)	32.06	30.37	28.10	22.73	16.31	11.87	7.21	3.70
	Sample B	Volumetric Water Content, θ	0.456	0.432	0.400	0.324	0.232	0.169	0.102	0.053
		Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035		
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416		
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001		
		Wt. rings/cup + wet soil (g)	101.04	101.04	101.04	101.04	101.04	101.04		
		Wt. rings/cup (g)	42.48	42.48	42.48	42.48	42.48	42.48		
		Moist unit wt., γ_m (pcf)	96.65	96.65	96.65	96.65	96.65	96.65		
		Wet soil + tare (g)	304.54	304.54	304.54	304.54	304.54	304.54		
		Dry soil + tare (g)	289.91	289.91	289.91	289.91	289.91	289.91		
		Tare (g)	123.34	123.34	123.34	123.34	123.34	123.34		
		Moisture Content, w (%)	8.8	8.8	8.8	8.8	8.8	8.8		
		Dry Unit Wt., γ_d (pcf)	88.85	88.85	88.85	88.85	88.85	88.85		
		Wet soil + ring/cup (g)	113.86	112.86	111.67	108.66	104.88	102.81		
		Dry soil + ring/cup (g)	96.31	96.31	96.31	96.31	96.31	96.31		
		Ring/cup (g)	42.48	42.48	42.48	42.48	42.48	42.48		
		Dry soil (g)	53.83	53.83	53.83	53.83	53.83	53.83		
		Moisture Content, w (%)	32.60	30.74	28.53	22.94	15.92	12.07		
		Volumetric Water Content, θ	0.464	0.438	0.406	0.327	0.227	0.172		
		Average Volumetric Moisture:	0.460	0.435	0.403	0.325	0.229	0.170	0.102	0.053

Comments:

*Points 7 and 8 were performed on a Chilled Mirror Hygrometer

Entered by:_____

Reviewed:_____

Determination of the Soil Water Characteristic Curve for Desorption**Using Pressure Extractor**

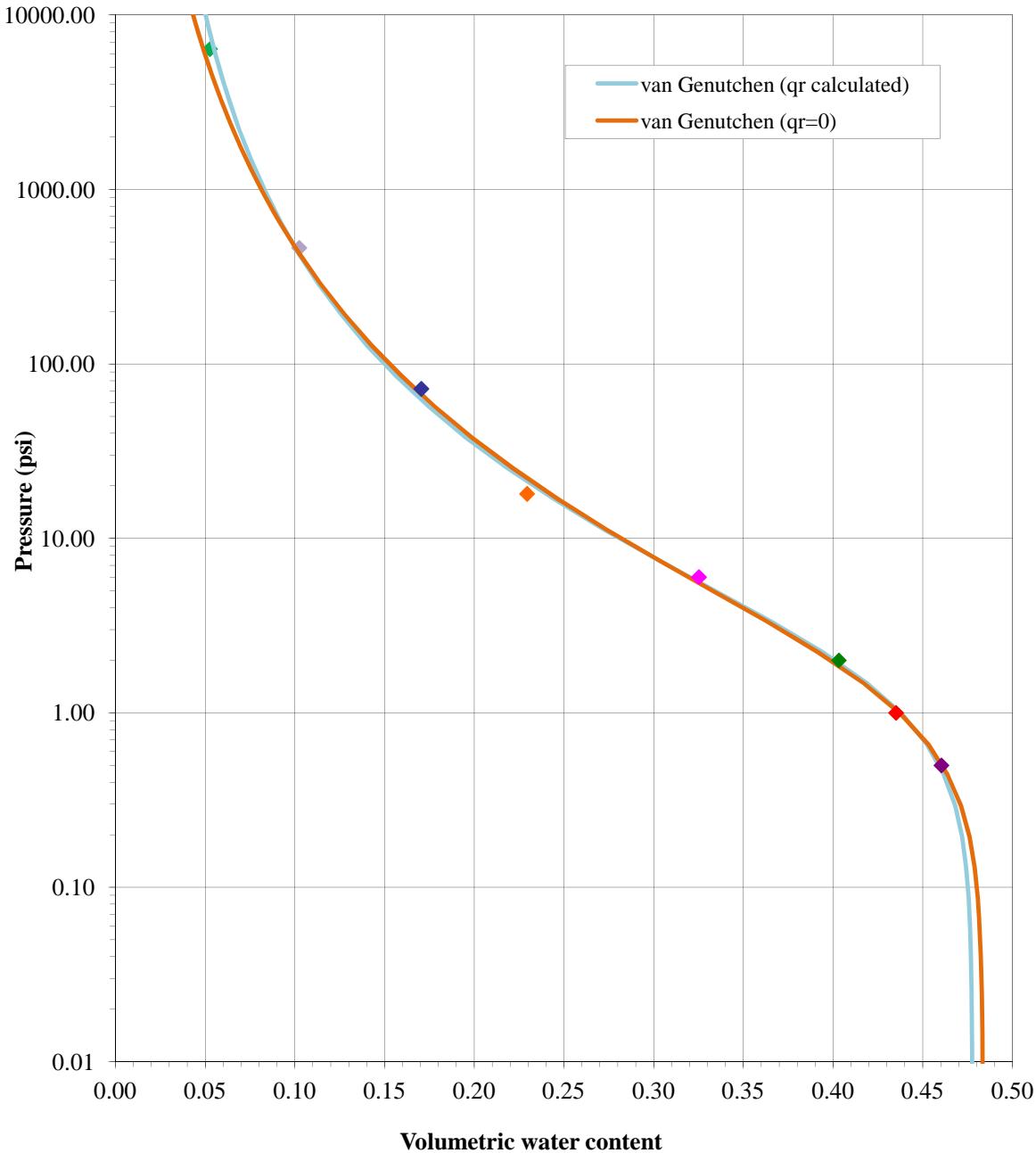
(In general accordance with ASTM D6836)



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Project: MWH
No: 00303-014
Location: FMC RDRA Data Gap Investigation
Date: 1/15/2014

Boring No.: WUA-TP006-01
Sample:
Depth: 1-10'
Description: Brown silty clay



van Genuchten fitting parameters (using SWRC fit, Seki, K. (2007)):

 θ_r calculated

θ_s	0.4776	θ_s	0.4834
θ_r	0.0191	θ_r	0
α	0.5592	α	0.6705
n	1.3116	n	1.2739
m	0.2376	m	0.2150
R ²	0.9988	R ²	0.9985

Determination of the Soil Water Characteristic Curve for Desorption

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Using Pressure Extractor

(In general accordance with ASTM D6836)

Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

Date: 1/15/2014

By: NB/MP

Specific gravity, Gs: 2.650 Assumed

Boring No.: WUA-TP007-01**Sample:****Depth: 1-10'**

Description: Brown silt

Sample type: Laboratory compacted

Dry unit weight 88.6 pcf

at 8.5 (%) w

Compaction specifications: 85% of

ASTM D698B

		Test No.	1	2	3	4	5	6	7*	8*	
	Tension (psi)	0.5	1.0	2.0	6.0	18.0	72.0	433.66	6612.27		
Sample A	Initial Condition	Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035	0.1865	0.1863	
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416	1.4717	1.4710	
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001	0.0002	0.0002	
		Wt. rings/cup + wet soil (g)	100.70	100.70	100.70	100.70	100.70	100.70	32.462	32.209	
		Wt. rings/cup (g)	42.58	42.58	42.58	42.58	42.58	42.58	24.556	24.586	
		Moist soil, Ws (g)	58.12	58.12	58.12	58.12	58.12	58.12	7.906	7.623	
		Dry soil (g)	53.71	53.71	53.71	53.71	53.71	53.71	7.368	7.343	
		Moist unit wt., γ_m (pcf)	95.92	95.92	95.92	95.92	95.92	95.92	94.94	91.72	
		Wet soil + tare (g)	304.93	304.93	304.93	304.93	304.93	304.93	32.462	32.209	
		Dry soil + tare (g)	291.11	291.11	291.11	291.11	291.11	291.11	31.924	31.929	
	Final Condition	Tare (g)	123.00	123.00	123.00	123.00	123.00	123.00	24.556	24.586	
		Moisture Content, w (%)	8.2	8.2	8.2	8.2	8.2	8.2	7.30	3.81	
		Dry Unit Wt., γ_d (pcf)	88.64	88.64	88.64	88.64	88.64	88.64	88.48	88.35	
		Wet soil + ring/cup (g)	113.27	111.89	110.72	106.51	103.65	102.04	32.452	32.206	
		Dry soil + ring/cup (g)	96.29	96.29	96.29	96.29	96.29	96.29	31.924	31.929	
Sample B	Initial Condition	Ring/cup (g)	42.58	42.58	42.58	42.58	42.58	42.58	24.556	24.586	
		Dry soil (g)	53.71	53.71	53.71	53.71	53.71	53.71	7.368	7.343	
		Moisture Content, w (%)	31.63	29.06	26.88	19.04	13.71	10.72	7.17	3.77	
		Volumetric Water Content, θ	0.449	0.413	0.382	0.270	0.195	0.152	0.102	0.053	
		Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035			
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416			
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001			
		Wt. rings/cup + wet soil (g)	101.26	101.26	101.26	101.26	101.26	101.26			
		Wt. rings/cup (g)	43.11	43.11	43.11	43.11	43.11	43.11			
		Moist unit wt., γ_m (pcf)	95.97	95.97	95.97	95.97	95.97	95.97			
	Final Condition	Wet soil + tare (g)	304.93	304.93	304.93	304.93	304.93	304.93			
		Dry soil + tare (g)	291.11	291.11	291.11	291.11	291.11	291.11			
		Tare (g)	123.00	123.00	123.00	123.00	123.00	123.00			
		Moisture Content, w (%)	8.2	8.2	8.2	8.2	8.2	8.2			
		Dry Unit Wt., γ_d (pcf)	88.68	88.68	88.68	88.68	88.68	88.68			
	Final Condition	Wet soil + ring/cup (g)	113.98	113.22	111.66	107.07	104.39	103.04			
		Dry soil + ring/cup (g)	96.84	96.84	96.84	96.84	96.84	96.84			
		Ring/cup (g)	43.11	43.11	43.11	43.11	43.11	43.11			
		Dry soil (g)	53.73	53.73	53.73	53.73	53.73	53.73			
		Moisture Content, w (%)	31.89	30.48	27.58	19.03	14.05	11.53			
		Volumetric Water Content, θ	0.453	0.433	0.392	0.271	0.200	0.164			
		Average Volumetric Moisture:	0.451	0.423	0.387	0.270	0.197	0.158	0.102	0.053	

Comments:

*Points 7 and 8 were performed on a Chilled Mirror Hygrometer

Entered by:_____

Reviewed:_____

Determination of the Soil Water Characteristic Curve for Desorption**Using Pressure Extractor**

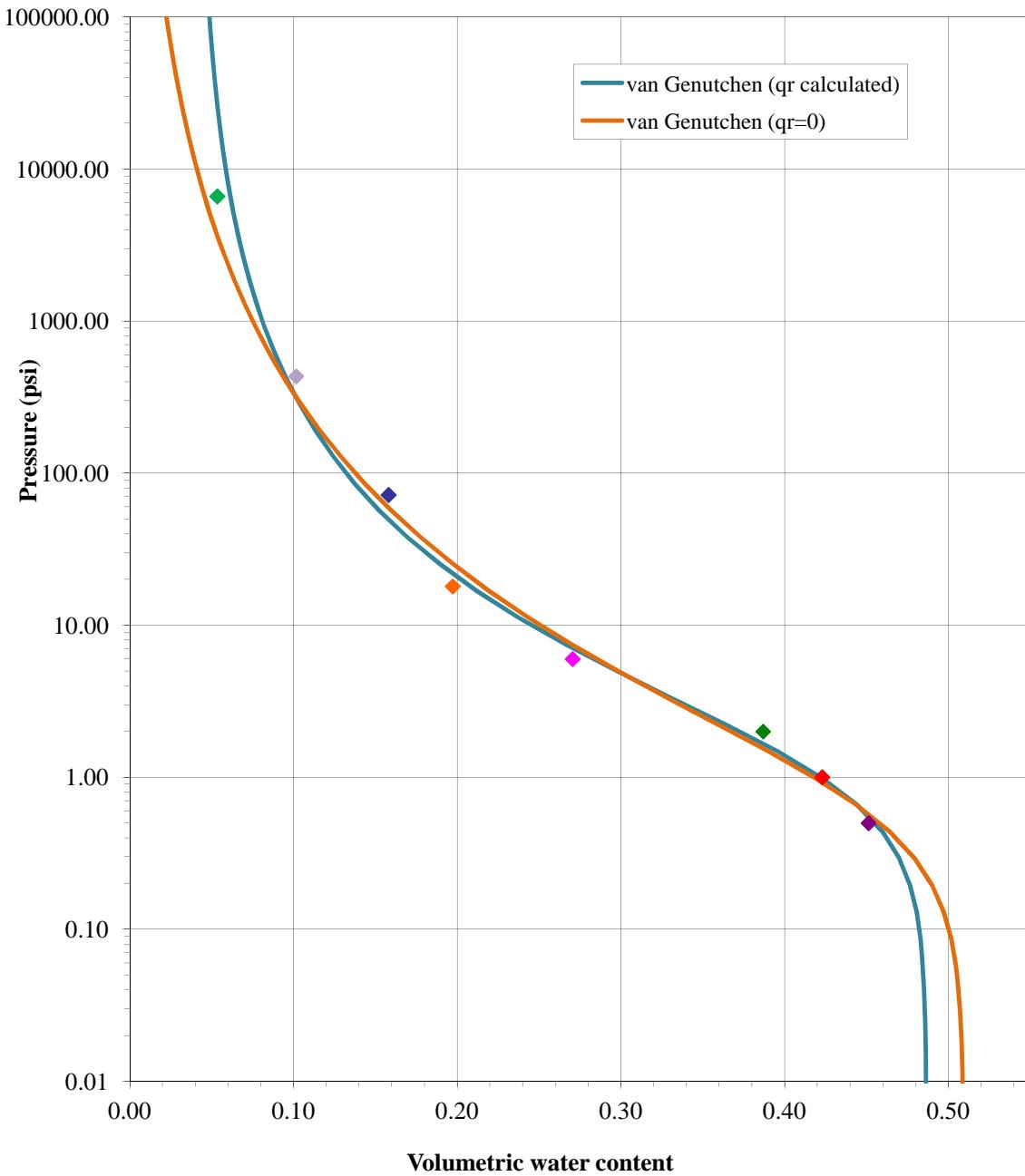
(In general accordance with ASTM D6836)



© IGES 2014

Project: MWH
No: 00303-014
Location: FMC RDRA Data Gap Investigation
Date: 1/15/2014

Boring No.: WUA-TP007-01
Sample:
Depth: 1-10'
Description: Brown silt



van Genuchten fitting parameters (using SWRC fit, Seki, K. (2007)):

 θ_r calculated

θ_s	0.4865	θ_s	0.5091
θ_r	0.0409	θ_r	0
α	0.8571	α	1.4349
n	1.3562	n	1.2632
m	0.2626	m	0.2084
R ²	0.9947	R ²	0.9926

Determination of the Soil Water Characteristic Curve for Desorption

© IGES 2014

Using Pressure Extractor

(In general accordance with ASTM D6836)

Project: MWH**No: 00303-014**

Location: FMC RDRA Data Gap Investigation

Date: 1/15/2014

By: NB/MP

Specific gravity, Gs: 2.650 Assumed

Boring No.: WUA-TP008-01**Sample:****Depth: 1-10'**

Description: Brown silt

Sample type: Laboratory compacted

Dry unit weight 84.7 pcf

at 8.5 (%) w

Compaction specifications: 85% of

ASTM D698B

		Test No.	1	2	3	4	5	6	7*	8*	
	Tension (psi)	0.5	1.0	2.0	6.0	18.0	72.0	577.25	12281.80		
Sample A	Initial Condition	Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035	0.1900	0.1892	
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416	1.4713	1.4718	
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001	0.0002	0.0002	
		Wt. rings/cup + wet soil (g)	100.65	100.65	100.65	100.65	100.65	100.65	32.165	31.985	
		Wt. rings/cup (g)	44.89	44.89	44.89	44.89	44.89	44.89	24.447	24.557	
		Moist soil, Ws (g)	55.76	55.76	55.76	55.76	55.76	55.76	7.718	7.428	
		Dry soil (g)	51.35	51.35	51.35	51.35	51.35	51.35	7.147	7.152	
		Moist unit wt., γ_m (pcf)	92.03	92.03	92.03	92.03	92.03	92.03	91.02	87.91	
		Wet soil + tare (g)	379.66	379.66	379.66	379.66	379.66	379.66	32.165	31.985	
		Dry soil + tare (g)	360.76	360.76	360.76	360.76	360.76	360.76	31.594	31.709	
	Final Condition	Tare (g)	140.47	140.47	140.47	140.47	140.47	140.47	24.447	24.557	
		Moisture Content, w (%)	8.6	8.6	8.6	8.6	8.6	8.6	7.99	3.86	
		Dry Unit Wt., γ_d (pcf)	84.76	84.76	84.76	84.76	84.76	84.76	84.28	84.64	
		Wet soil + ring/cup (g)	114.84	114.05	112.48	107.60	103.87	102.26	32.152	31.979	
		Dry soil + ring/cup (g)	96.24	96.24	96.24	96.24	96.24	96.24	31.594	31.709	
Sample B	Initial Condition	Ring/cup (g)	44.89	44.89	44.89	44.89	44.89	44.89	24.447	24.557	
		Dry soil (g)	51.35	51.35	51.35	51.35	51.35	51.35	7.147	7.152	
		Moisture Content, w (%)	36.21	34.67	31.62	22.11	14.85	11.71	7.81	3.78	
		Volumetric Water Content, θ	0.492	0.471	0.429	0.300	0.202	0.159	0.105	0.051	
		Sample height, H (in)	0.5035	0.5035	0.5035	0.5035	0.5035	0.5035			
		Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416			
		Sample Volume (ft ³)	0.001	0.001	0.001	0.001	0.001	0.001			
		Wt. rings/cup + wet soil (g)	101.75	101.75	101.75	101.75	101.75	101.75			
		Wt. rings/cup (g)	45.98	45.98	45.98	45.98	45.98	45.98			
		Moist unit wt., γ_m (pcf)	92.04	92.04	92.04	92.04	92.04	92.04			
	Final Condition	Wet soil + tare (g)	379.66	379.66	379.66	379.66	379.66	379.66			
		Dry soil + tare (g)	360.76	360.76	360.76	360.76	360.76	360.76			
		Tare (g)	140.47	140.47	140.47	140.47	140.47	140.47			
		Moisture Content, w (%)	8.6	8.6	8.6	8.6	8.6	8.6			
		Dry Unit Wt., γ_d (pcf)	84.77	84.77	84.77	84.77	84.77	84.77			
	Final Condition	Wet soil + ring/cup (g)	115.88	114.65	113.25	108.03	104.97	103.23			
		Dry soil + ring/cup (g)	97.34	97.34	97.34	97.34	97.34	97.34			
		Ring/cup (g)	45.98	45.98	45.98	45.98	45.98	45.98			
		Dry soil (g)	51.36	51.36	51.36	51.36	51.36	51.36			
		Moisture Content, w (%)	36.09	33.69	30.97	20.81	14.85	11.46			
		Volumetric Water Content, θ	0.490	0.458	0.421	0.283	0.202	0.156			
			Average Volumetric Moisture:	0.491	0.464	0.425	0.292	0.202	0.157	0.105	0.051

Comments:

*Points 7 and 8 were performed on a Chilled Mirror Hygrometer

Entered by:_____

Reviewed:_____

Determination of the Soil Water Characteristic Curve for Desorption**Using Pressure Extractor**

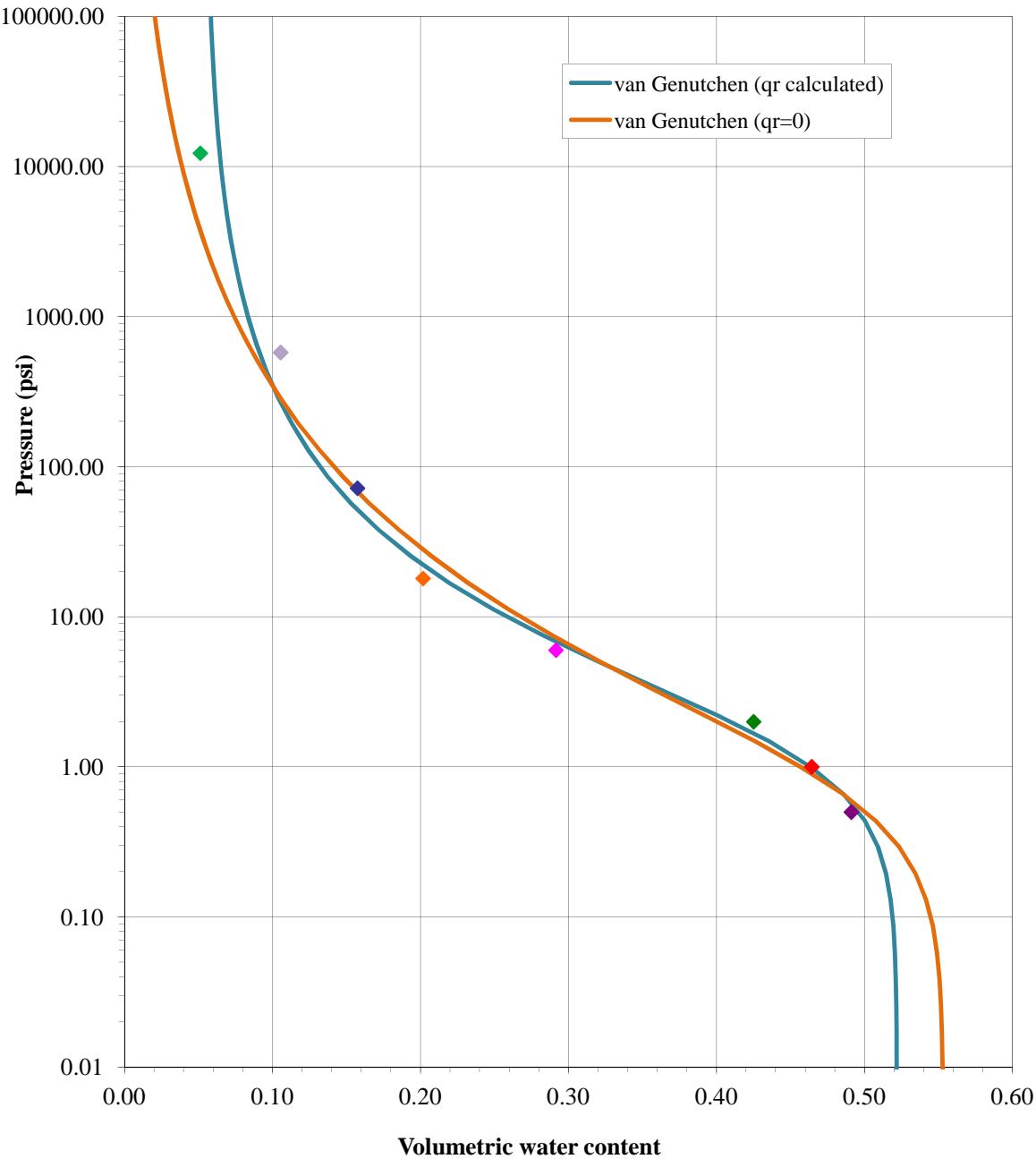
(In general accordance with ASTM D6836)



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Project: MWH
No: 00303-014
Location: FMC RDRA Data Gap Investigation
Date: 1/15/2014

Boring No.: WUA-TP008-01
Sample:
Depth: 1-10'
Description: Brown silt



van Genuchten fitting parameters (using SWRC fit, Seki, K. (2007)):

 θ_r calculated

θ_s	0.5219	θ_s	0.5533
θ_r	0.0543	θ_r	0
α	0.6665	α	1.2965
n	1.4267	n	1.2802
m	0.2991	m	0.2189
R ²	0.9946	R ²	0.9898

APPENDIX E

Agronomic Testing Reports

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

December 11, 2013

Report to:

Chad Tomlinson
MWH Americas Inc.
2890 E. Cottonwood Pkwy.
Suite 300
Salt Lake City, UT 84121

Bill to:

Accounts Payable
MWH Americas Inc.
P.O. Box 6610
Broomfield, CO 80021

Project ID: 10503311.020102 FML

ACZ Project ID: L15653

Chad Tomlinson:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on November 20, 2013. This project has been assigned to ACZ's project number, L15653. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L15653. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after January 10, 2014. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.



ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

**Case
Narrative**

MWH Americas Inc.

December 11, 2013

Project ID: 10503311.020102 FML

ACZ Project ID: L15653

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 3 soil samples from MWH Americas Inc. on November 20, 2013. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L15653. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Samples were received outside the EPA recommended temperature of 0-6 degrees C.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The extended qualifier reports may contain footnotes qualifying specific elements due to QC failures. In addition the following has been noted with this specific project:

1. (B1) Target analyte detected in prep blank at or above the method reporting limit. This is due to procedural contamination at the prep level. Client may opt to blank subtract at their discretion.



Inorganic Analytical Results

MWH Americas Inc.

Project ID: 10503311.020102 FML
Sample ID: WUA-CP01

ACZ Sample ID: **L15653-01**
Date Sampled: 11/05/13 10:00
Date Received: 11/20/13
Sample Matrix: Soil

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	1	8.50	*		meq/100g	0.03	0.2	12/05/13 11:36	aeb
Phosphorus, total (3050)	M6010B ICP	101	790	*		mg/Kg	10	50	12/02/13 21:44	aeb
Potassium, total (3050)	M6010B ICP	101	2410			mg/Kg	30	200	12/02/13 21:44	aeb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Carbon, total organic (TOC)	ASA No.9 29-2.2.4 Combustion/IR	1	0.2	B	*	%	0.1	0.5	12/05/13 14:52	cra
Conductivity @25C	SM2510B									
Conductivity		1	0.442		*	mmhos/cm	0.001	0.01	11/27/13 0:00	spl
Max Particle Size		1	2000		*	um			11/27/13 0:00	spl
Organic Matter	USDA No.60 - Method 24	1	0.8	B	*	%	0.3	1	11/25/13 22:08	cra
pH, Saturated Paste	EPA 600/2-78-054, section 3.2.2									
Max Particle Size		1	2000		*	um			11/27/13 0:00	spl
pH		1	8.6		*	units	0.1	0.1	11/27/13 0:00	spl
Solids, Percent	CLPSOW390, PART F, D-98	1	94.1		*	%	0.1	0.5	11/22/13 13:54	spl

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972				*				11/24/13 11:00	mss2
Cation Exchange Capacity Extraction	USDA No. 60 (19)				*				12/04/13 18:22	cdb
Digestion - Hot Plate	M3050B ICP								11/26/13 13:20	mss2
Potassium Chloride Extraction	ASA No. 9 33-3.2.2				*				12/04/13 15:00	spl
Saturated Paste Extraction	USDA No. 60 (2)				*				11/26/13 14:20	spl
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2				*				11/25/13 11:00	cra
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2				*				11/25/13 11:00	cra

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, ammonia (KCL)	M350.1 - Automated Phenate	10	10.6	*		mg/Kg	0.5	5	12/10/13 17:16	bsu

Arizona license number: AZ0102



Inorganic Analytical Results

MWH Americas Inc.

Project ID: 10503311.020102 FML
Sample ID: WUA-CP02

ACZ Sample ID: **L15653-02**
Date Sampled: 11/05/13 10:00
Date Received: 11/20/13
Sample Matrix: Soil

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	1	11.0	*		meq/100g	0.03	0.2	12/05/13 11:45	aeb
Phosphorus, total (3050)	M6010B ICP	102	780	*		mg/Kg	10	50	12/02/13 21:53	aeb
Potassium, total (3050)	M6010B ICP	102	2780			mg/Kg	30	200	12/02/13 21:53	aeb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Carbon, total organic (TOC)	ASA No.9 29-2.2.4 Combustion/IR	1	0.2	B	*	%	0.1	0.5	12/06/13 2:37	cra
Conductivity @25C	SM2510B									
Conductivity		1	0.594		*	mmhos/cm	0.001	0.01	11/27/13 0:00	spl
Max Particle Size		1	2000		*	um			11/27/13 0:00	spl
Organic Matter	USDA No.60 - Method 24	1	0.9	B	*	%	0.3	1	11/26/13 4:17	cra
pH, Saturated Paste	EPA 600/2-78-054, section 3.2.2									
Max Particle Size		1	2000		*	um			11/27/13 0:00	spl
pH		1	8.4		*	units	0.1	0.1	11/27/13 0:00	spl
Solids, Percent	CLPSOW390, PART F, D-98	1	91.9		*	%	0.1	0.5	11/22/13 14:57	spl

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972				*				11/24/13 11:30	mss2
Cation Exchange Capacity Extraction	USDA No. 60 (19)				*				12/04/13 23:15	cdb
Digestion - Hot Plate	M3050B ICP								11/26/13 15:20	mss2
Potassium Chloride Extraction	ASA No. 9 33-3.2.2				*				12/04/13 17:00	spl
Saturated Paste Extraction	USDA No. 60 (2)				*				11/27/13 4:16	spl
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2				*				11/25/13 11:30	cra
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2				*				11/25/13 11:30	cra

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, ammonia (KCL)	M350.1 - Automated Phenate	10	11.1	*		mg/Kg	0.5	5	12/10/13 17:19	bsu

Arizona license number: AZ0102



Inorganic Analytical Results

MWH Americas Inc.

Project ID: 10503311.020102 FML
Sample ID: WUA-CP03

ACZ Sample ID: **L15653-03**
Date Sampled: 11/05/13 10:00
Date Received: 11/20/13
Sample Matrix: Soil

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	1	10.0	*		meq/100g	0.03	0.2	12/05/13 11:52	aeb
Phosphorus, total (3050)	M6010B ICP	101	790	*		mg/Kg	10	50	12/02/13 21:56	aeb
Potassium, total (3050)	M6010B ICP	101	2620			mg/Kg	30	200	12/02/13 21:56	aeb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Carbon, total organic (TOC)	ASA No.9 29-2.2.4 Combustion/IR	1	0.2	B	*	%	0.1	0.5	12/06/13 8:30	cra
Conductivity @25C	SM2510B									
Conductivity		1	0.456		*	mmhos/cm	0.001	0.01	11/27/13 0:00	spl
Max Particle Size		1	2000		*	um			11/27/13 0:00	spl
Organic Matter	USDA No.60 - Method 24	1	0.9	B	*	%	0.3	1	11/26/13 7:21	cra
pH, Saturated Paste	EPA 600/2-78-054, section 3.2.2									
Max Particle Size		1	2000		*	um			11/27/13 0:00	spl
pH		1	8.5		*	units	0.1	0.1	11/27/13 0:00	spl
Solids, Percent	CLPSOW390, PART F, D-98	1	93.0		*	%	0.1	0.5	11/22/13 16:00	spl

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972				*				11/24/13 12:00	mss2
Cation Exchange Capacity Extraction	USDA No. 60 (19)				*				12/05/13 4:07	cdb
Digestion - Hot Plate	M3050B ICP								11/26/13 16:00	mss2
Potassium Chloride Extraction	ASA No. 9 33-3.2.2				*				12/04/13 18:00	spl
Saturated Paste Extraction	USDA No. 60 (2)				*				11/27/13 11:15	spl
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2				*				11/25/13 12:00	cra
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2				*				11/25/13 12:00	cra

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Nitrogen, ammonia (KCL)	M350.1 - Automated Phenate	10	10.7	*		mg/Kg	0.5	5	12/10/13 17:21	bsu

Arizona license number: AZ0102

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Reference

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit, typically 5 times the MDL.
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

<i>B</i>	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
<i>H</i>	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
<i>L</i>	Target analyte response was below the laboratory defined negative threshold.
<i>U</i>	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic QC Summary
MWH Americas Inc.

 ACZ Project ID: **L15653**
Carbon, total organic (TOC)

ASA No.9 29-2.2.4 Combustion/IR

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG355912													
WG355912PBS	PBS	12/05/13 9:00				U	%		-0.3	0.3			
L15653-01DUP	DUP	12/05/13 20:45			.2	.2	%				0	20	RA ZQ

Cation Exchange Capacity (CEC)

USDA No. 60 (19)

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG355925													
WG355925ICV	ICV	12/05/13 11:17	II131113-1	100		97.97	mg/L	98	90	110			
WG355925ICB	ICB	12/05/13 11:20				U	meq/100g		-0.9	0.9			
WG355857PBS	PBS	12/05/13 11:33				U	meq/100g		-0.09	0.09			
L15653-01AS	AS	12/05/13 11:39	IICECSPIKE	10.8763	8.5	17.0846	meq/100g	78.9	75	125			
L15653-01ASD	ASD	12/05/13 11:42	IICECSPIKE	10.8763	8.5	17.4218	meq/100g	82	75	125	1.95	20	
L15653-03DUP	DUP	12/05/13 11:55			10	10.1496	meq/100g				1.5	20	

Conductivity @25C

SM2510B

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG355542													
L15653-01DUP	DUP	11/27/13 3:24			.442	.443	nmhos/cn				0.2	20	

Nitrogen, ammonia (KCL)

M350.1 - Automated Phenate

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG356166													
WG356166ICV	ICV	12/10/13 12:10	WI131021-1	1.003		1.041	mg/L	103.8	90	110			
WG356166ICB	ICB	12/10/13 12:13				U	mg/L		-0.15	0.15			
WG356206													
WG356206LFB	LFB	12/10/13 17:14	WI121218-3	1		1.093	mg/L	109.3	90	110			
WG355866PBS	PBS	12/10/13 17:15				6.27	mg/Kg		-1.5	1.5			B1
L15653-01DUP	DUP	12/10/13 17:17			10.6	9.9	mg/Kg				6.8	20	
L15653-02AS	AS	12/10/13 17:20	WI121218-3	10	11.1	21.68	mg/Kg	105.8	75	125			

Organic Matter

USDA No.60 - Method 24

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG355454													
WG355454LCSS	LCSS	11/25/13 16:00	PCN32557	2		1.95	%	97.5					
WG355454PBS	PBS	11/25/13 19:04				U	%		-0.3	0.3			
L15653-01DUP	DUP	11/26/13 1:12			.8	.72	%				10.5	20	RA

pH, Saturated Paste

EPA 600/2-78-054, section 3.2.2

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG355542													
WG355542ICV	ICV	11/26/13 22:10	PCN42578	4		4	units	100	3.9	4.1			
L15653-01DUP	DUP	11/27/13 3:24			8.6	8.66	units				0.7	20	

ACZ Laboratories, Inc.

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Inorganic QC Summary
MWH Americas Inc.

 ACZ Project ID: **L15653**
Phosphorus, total (3050)

M6010B ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG355673													
WG355673ICV	ICV	12/02/13 21:13	II131111-1	5		5.19	mg/L	103.8	90	110			
WG355673ICB	ICB	12/02/13 21:16			U	mg/L			-0.3	0.3			
WG355503PBS	PBS	12/02/13 21:28			U	mg/Kg			-30	30			
WG355503LCSS2	LCSS	12/02/13 21:38	PCN39902	842	704	mg/Kg			673.6	1010.4			
WG355503LCSSD2	LCSSD	12/02/13 21:41	PCN39902	842	704	mg/Kg			673.6	1010.4	0	20	
L15653-01MS	MS	12/02/13 21:47	II131119-3	101.0202	790	892	mg/Kg	101	75	125			
L15653-01MSD	MSD	12/02/13 21:50	II131119-3	101.0202	790	879	mg/Kg	88.1	75	125	1.47	20	

Potassium, total (3050)

M6010B ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG355673													
WG355673ICV	ICV	12/02/13 21:13	II131111-1	20		19.64	mg/L	98.2	90	110			
WG355673ICB	ICB	12/02/13 21:16			U	mg/L			-0.9	0.9			
WG355503PBS	PBS	12/02/13 21:28			U	mg/Kg			-90	90			
WG355503LCSS1	LCSS	12/02/13 21:32	PCN42472	2600	2612	mg/Kg			1720	3470			
WG355503LCSSD1	LCSSD	12/02/13 21:35	PCN42472	2600	2872	mg/Kg			1720	3470	9.5	20	
L15653-01MS	MS	12/02/13 21:47	II131119-3	10094.48439	2410	13009	mg/Kg	105	75	125			
L15653-01MSD	MSD	12/02/13 21:50	II131119-3	10094.48439	2410	13059	mg/Kg	105.5	75	125	0.38	20	

Solids, Percent

CLPSOW390, PART F, D-98

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG355296													
WG355296PBS	PBS	11/21/13 19:00				U	%		99.9	100.1			
L15561-01DUP	DUP	11/21/13 22:09			23.9	24.39	%				2	20	

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

MWH Americas Inc.

ACZ Project ID: L15653

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L15653-01	WG355925	Cation Exchange Capacity (CEC)	USDA No. 60 (19)	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG355912	Carbon, total organic (TOC)	ASA No.9 29-2.2.4 Combustion/IR	Q6	Sample was received above recommended temperature.
			ASA No.9 29-2.2.4 Combustion/IR	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
			ASA No.9 29-2.2.4 Combustion/IR	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG355454	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG356206	Nitrogen, ammonia (KCL)	M350.1 - Automated Phenate	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
L15653-02	WG355925	Cation Exchange Capacity (CEC)	USDA No. 60 (19)	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG355912	Carbon, total organic (TOC)	ASA No.9 29-2.2.4 Combustion/IR	Q6	Sample was received above recommended temperature.
			ASA No.9 29-2.2.4 Combustion/IR	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
			ASA No.9 29-2.2.4 Combustion/IR	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG355454	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG356206	Nitrogen, ammonia (KCL)	M350.1 - Automated Phenate	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.
L15653-03	WG355925	Cation Exchange Capacity (CEC)	USDA No. 60 (19)	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG355912	Carbon, total organic (TOC)	ASA No.9 29-2.2.4 Combustion/IR	Q6	Sample was received above recommended temperature.
			ASA No.9 29-2.2.4 Combustion/IR	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
			ASA No.9 29-2.2.4 Combustion/IR	ZQ	Analyte was not evaluated in the laboratory control standard. Either the analyte is not included in the scope of the analytical method or a commercial standard containing the analyte is not available.
	WG355454	Organic Matter	USDA No.60 - Method 24	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG356206	Nitrogen, ammonia (KCL)	M350.1 - Automated Phenate	B1	Target analyte detected in prep / method blank at or above the method reporting limit. See Case Narrative.

ACZ Laboratories, Inc.

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Certification Qualifiers

MWH Americas Inc.

ACZ Project ID: L15653

Metals Analysis

The following parameters are not offered for certification or are not covered by AZ certificate #AZ0102.

Cation Exchange Capacity (CEC)	USDA No. 60 (19)
Phosphorus, total (3050)	M6010B ICP

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Cation Exchange Capacity (CEC)	USDA No. 60 (19)
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Soil Analysis

The following parameters are not offered for certification or are not covered by AZ certificate #AZ0102.

Carbon, total organic (TOC)	ASA No.9 29-2.2.4 Combustion/IR
Conductivity @25C	SM2510B
Organic Matter	USDA No.60 - Method 24
pH, Saturated Paste	EPA 600/2-78-054, section 3.2.2
Solids, Percent	CLPSOW390, PART F, D-98

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Carbon, total organic (TOC)	ASA No.9 29-2.2.4 Combustion/IR
Conductivity @25C	SM2510B
Organic Matter	USDA No.60 - Method 24
pH, Saturated Paste	EPA 600/2-78-054, section 3.2.2
Solids, Percent	CLPSOW390, PART F, D-98

Wet Chemistry

The following parameters are not offered for certification or are not covered by AZ certificate #AZ0102.

Nitrogen, ammonia (KCL)	M350.1 - Automated Phenate
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The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Nitrogen, ammonia (KCL)	M350.1 - Automated Phenate
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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

**Sample
Receipt**

MWH Americas Inc.
10503311.020102 FML

ACZ Project ID: L15653
Date Received: 11/20/2013 10:28
Received By: mtb
Date Printed: 11/21/2013

Receipt Verification

- 1) Is a foreign soil permit included for applicable samples?
- 2) Is the Chain of Custody or other directive shipping papers present?
- 3) Does this project require special handling procedures such as CLP protocol?
- 4) Are any samples NRC licensable material?
- 5) If samples are received past hold time, proceed with requested short hold time analyses?
- 6) Is the Chain of Custody complete and accurate?
- 7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?

YES	NO	NA
		X
X		
		X
		X
X		
X		
	X	

Samples/Containers

- 8) Are all containers intact and with no leaks?
- 9) Are all labels on containers and are they intact and legible?
- 10) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?
- 11) For preserved bottle types, was the pH checked and within limits?
- 12) Is there sufficient sample volume to perform all requested work?
- 13) Is the custody seal intact on all containers?
- 14) Are samples that require zero headspace acceptable?
- 15) Are all sample containers appropriate for analytical requirements?
- 16) Is there an Hg-1631 trip blank present?
- 17) Is there a VOA trip blank present?
- 18) Were all samples received within hold time?

YES	NO	NA
X		
X		
X		
		X
X		
		X
		X
		X
X		
		X
		X
		X
X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/Hr)	Custody Seal Intact?
NA18751	14.8	13	N/A

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Chad Tomlinson
MWH Americas Inc.
2890 E. Cottonwood Pkwy. Suite 300
Salt Lake City, UT 84121

Page 1 of 2
11/7/2013

Quote Number: FMC-AGRONOMIC

Matrix: Soil 3 Samples, One Time Analysis of Soil - FMC Agronomic Testing

Parameter	Method	Detection Limit	Cost/Sample
Metals Analysis			
Cation Exchange Capacity (CEC)	USDA No. 60 (19)	0.03 meq/100g	\$24.00
Phosphorus, total (3050)	M6010B ICP	10 mg/Kg	\$10.00
Potassium, total (3050)	M6010B ICP	30 mg/Kg	\$10.00
Misc.			
Electronic Data Deliverable			\$0.00
Quality Control Summary			\$0.00
Setup charge for ICP, total			\$16.00
Sample Preparation			
Air Dry at 34 Degrees C	USDA No. 1, 1972		\$8.00
Cation Exchange Capacity Extraction	USDA No. 60 (19)		\$0.00
Digestion - Hot Plate	M3050B ICP		\$16.00
Potassium Chloride Extraction	ASA No. 9 33-3.2.2		\$12.00
Saturated Paste Extraction	USDA No. 60 (2)		\$18.00
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2		\$12.00
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2		\$12.00
Soil Analysis			
Carbon, total organic (TOC)	ASA No.9 29-2.2.4 Combustion/IR	0.1 %	\$38.00
Conductivity @25C	SM2510B	0.001 mmhos/cm	\$8.00
Organic Matter	USDA No.60 - Method 24	0.3 %	\$25.00
pH, Saturated Paste	EPA 600/2-78-054, section 3.2.2	0.1 units	\$8.00
Solids, Percent	CLPSOW390, PART F, D-98	0.1 %	\$8.00
Wet Chemistry			
Nitrogen, ammonia (KCL)	M350.1 - Automated Phenate	0.5 mg/Kg	\$11.00
Cost/Sample:			\$236.00

This quote is based on a Standard Turnaround Time (TAT) of approximately 21 days for soil and solid matrices (15 working days). TAT may vary with seasonal heavy workload. Please contact your PM if rush TAT is required. Rush TAT needs to be pre-approved prior to sample shipment to assure that due dates can be met. Pricing includes standard reporting formats and standard ACZ EDDs. All projects received are subject to a \$125.00 Minimum Charge. Please note that method detection limits are estimates and may be elevated depending on sample matrices that require dilution. Pricing includes coolers, soil jars or bags, labels, COCs and ice-packs if needed for your analysis, shipped to your site or office via UPS ground. Return shipping is the responsibility of the client. Please allow ample time for your bottles to arrive. Please note that soil preparation charges may fluctuate depending on the condition and volume of samples upon receipt. Wet samples may increase your TAT if air-drying is needed per your analysis.

REPAD.09.06.05.01

S/ m D/ P/



2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Chad Tomlinson
MWH Americas Inc.
2890 E. Cottonwood Pkwy. Suite 300
Salt Lake City, UT 84121

Page 2 of 2
11/7/2013

Quote Number: FMC-AGRONOMIC

CONTRACT DETAILS

Pricing includes shipment of all standard sample containers and related paperwork by UPS Ground Service. Please allow three to five days for delivery when ordering containers. ACZ must be notified prior to receiving samples of all special requests such as electronic data deliverables or special reporting requirements. The client will be charged for special sample containers or express shipping and additional charges may apply for non-standard requests.

This quotation is valid for six months from the bid date unless specified otherwise in the bid. All bids must be signed and returned to ACZ before the project(s) is received. The authorized signature represents acceptance of the pricing as well as the general terms and conditions of ACZ Laboratories, Inc. which may be downloaded from our web site at <http://www.acz.com/PDF/termsconditions.pdf>. Please note that MDL's in this quote may possibly increase due to sample matrix or samples with high TDS.

All orders that require shipping of coolers are subject to a minimum charge of \$200.00. Local orders without shipping are subject to a minimum charge of \$125.00. Samples may incur a \$11.00/sample disposal fee for any samples deemed to be hazardous.

ACZ Representative (Authorized signature and date)

Client Representative (Authorized signature and date)

APPENDIX F

Root Density Testing Report

Table of Soil and Root Weights for FMC Vegetation Survey Sample Locations from Nov. 12 and 13, 2013.

Sample	Soil Dry Weight with Roots (grams)	Root Dry Weight (grams)	Soil Dry Weight Without Roots (grams)	Grams of Roots per 100 grams of Soil
Grid #6—Location #1				
0-6 inches	807.45	0.15	807.30	0.019
6-12 inches	798.26	0.62	797.64	0.078
12-18 inches	786.17	0.02	786.15	0.003
Grid #6—Location #2				
0-6 inches	785.39	0.66	784.73	0.084
6-12 inches	792.90	0.15	792.75	0.019
12-18 inches	837.52	0.12	837.40	0.014
Grid #6—Location #3				
0-6 inches	744.77	0.24	744.53	0.032
6-12 inches	823.04	0.11	822.93	0.013
12-18 inches	804.68	0.04	804.64	0.005
Grid #7—Location #1				
0-6 inches	684.09	0.27	683.82	0.039
6-12 inches	813.18	0.16	813.02	0.020
12-18 inches	832.20	0.11	832.09	0.013
Grid #7—Location #2				
0-6 inches	829.41	0.30	829.11	0.036
6-12 inches	746.12	0.22	745.90	0.029
12-18 inches	844.83	0.18	844.65	0.021
Grid #7—Location #3				
0-6 inches	764.65	0.68	763.97	0.089
6-12 inches	781.57	0.19	781.38	0.024
12-18 inches	872.89	0.13	872.76	0.015
Grid #8—Location #1				
0-6 inches	769.74	0.79	768.95	0.102
6-12 inches	No sample	No sample	No sample	No sample
12-18 inches	806.99	0.16	806.83	0.020
18-24 inches	849.00	0.05	848.95	0.006
Grid #8—Location #2				
0-6 inches	762.51	0.58	761.93	0.076
6-12 inches	872.86	0.65	872.21	0.075
12-18 inches	801.06	0.10	800.96	0.013
18-24 inches	742.14	0.03	742.11	0.004
Grid #8—Location #3				
0-6 inches	797.74	0.38	797.36	0.048
6-12 inches	820.28	0.23	820.05	0.028
12-18 inches	839.66	0.11	839.55	0.013
Grid #13—Location #1				
0-6 inches	839.18	0.87	838.31	0.104
6-12 inches	699.50	0.25	699.25	0.036
12-18 inches	No sample	No sample	No sample	No sample

Sample	Soil Dry Weight with Roots (grams)	Root Dry Weight (grams)	Soil Dry Weight Without Roots (grams)	Grams of Roots per 100 grams of Soil
Grid #13—Location #2				
0-6 inches	793.79	0.51	793.28	0.064
6-12 inches	849.62	0.27	849.35	0.032
12-18 inches	No sample	No sample	No sample	No sample
Grid #13—Location #3				
0-6 inches	725.44	0.73	724.71	0.101
6-12 inches	961.91	0.33	961.58	0.034
12-18 inches	867.40	0.12	867.28	0.014
Grid #14—Location #1				
0-6 inches	814.19	0.71	813.48	0.087
6-12 inches	833.37	0.45	832.92	0.054
12-18 inches	834.95	0.13	834.82	0.016
Grid #14—Location #2				
0-6 inches	713.84	0.78	713.06	0.109
6-12 inches	898.16	0.46	897.70	0.051
12-18 inches	797.55	0.21	797.34	0.026
Grid #14—Location #3				
0-6 inches	807.28	0.43	806.85	0.053
6-12 inches	780.36	0.31	780.05	0.040
12-18 inches	805.32	0.15	805.17	0.019
Grid #15—Location #1				
0-6 inches	835.20	0.45	834.75	0.054
6-12 inches	772.33	0.14	772.19	0.018
12-18 inches	800.00	0.09	799.91	0.011
Grid #15—Location #2				
0-6 inches	729.58	0.56	729.02	0.077
6-12 inches	746.83	0.28	746.55	0.038
12-18 inches	848.75	0.07	848.68	0.008
Grid #15—Location #3				
0-6 inches	759.06	0.45	758.61	0.060
6-12 inches	930.29	0.21	930.08	0.023
12-18 inches	777.64	0.10	777.54	0.013
Grid #16—Location #1				
0-6 inches	822.27	0.57	821.70	0.069
6-12 inches	772.75	0.39	772.36	0.051
12-18 inches	831.66	0.13	831.53	0.016
Grid #16—Location #2				
0-6 inches	707.11	0.83	706.28	0.118
6-12 inches	844.97	0.37	844.60	0.044
12-18 inches	791.54	0.18	791.36	0.023

Sample	Soil Dry Weight with Roots (grams)	Root Dry Weight (grams)	Soil Dry Weight Without Roots (grams)	Grams of Roots per 100 grams of Soil
Grid #16—Location #3				
0-6 inches	743.60	0.62	742.98	0.083
6-12 inches	822.37	0.25	822.12	0.030
12-18 inches	773.69	0.12	773.57	0.016
Grid #17—Location #1				
0-6 inches	708.05	0.66	707.39	0.093
6-12 inches	778.98	0.19	778.79	0.024
12-18 inches	901.58	0.12	901.46	0.013
18-24 inches	810.23	0.04	810.19	0.005
Grid #17—Location #2				
0-6 inches	833.19	0.43	832.76	0.052
6-12 inches	811.03	0.16	810.87	0.020
12-18 inches	893.77	0.13	893.64	0.015
18-24 inches	877.61	0.02	877.59	0.002
Grid #17—Location #3				
0-6 inches	806.03	0.30	805.73	0.037
6-12 inches	871.40	0.27	871.13	0.031
12-18 inches	795.86	0.12	795.74	0.015
18-24 inches	796.35	0.05	796.30	0.006
Grid #18—Location #1				
0-6 inches	838.61	0.12	838.49	0.014
6-12 inches	854.60	0.15	854.45	0.018
12-18 inches	798.19	0.02	798.17	0.003
Grid #18—Location #2				
0-6 inches	776.15	0.53	775.62	0.068
6-12 inches	785.08	0.18	784.90	0.023
12-18 inches	838.00	0.11	837.89	0.013
Grid #18—Location #3				
0-6 inches	761.44	0.31	761.13	0.041
6-12 inches	731.57	0.16	731.41	0.022
12-18 inches	784.39	0.09	784.30	0.011

APPENDIX G

Stormwater Sewer Decontamination Water Laboratory Analysis Report and Video Survey

IAS EnviroChem
3314 Pole Line Rd. • Pocatello, ID 83201
Phone: (208) 237-3300 • Fax: (208) 237-3336
email: iasec3308@iasenvirochem.com • www.iasenvirochem.com

Kase Warbonnet Inc.
Mark R. Smith
1477 Thunderbolt
Pocatello, ID 83204

Date Submitted: 11/14/2013
Date Reported: 12/03/2013

Certificate of Analysis

Sample Description: 111413-SDL
Lab Tracking #: I311052-01
Sampling Date/Time: 11/14/13 13:40

<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analyzed</u>	<u>Analyst</u>
pH	7.6	pH Units	150.1	11/18/2013	MAD
TCLP Arsenic	< 0.05	mg/L	1311/6020A	11/29/2013	RP
TCLP Barium	0.07	mg/L	1311/6020A	11/29/2013	RP
TCLP Cadmium	< 0.05	mg/L	1311/6020A	11/29/2013	RP
TCLP Chromium	0.08	mg/L	1311/6020A	11/29/2013	RP
TCLP Lead	< 0.05	mg/L	1311/6020A	11/29/2013	RP
TCLP Mercury	< 0.01	mg/L	1311/6020A	11/29/2013	RP
TCLP Selenium	< 0.05	mg/L	1311/6020A	11/29/2013	RP
TCLP Silver	< 0.05	mg/L	1311/6020A	11/29/2013	RP

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Kase Warbonnet Inc.
Mark R. Smith
1477 Thunderbolt
Pocatello, ID 83204

Date Submitted: 11/14/2013
Date Reported: 12/03/2013

Certificate of Analysis

Sample Description: 111413-SDS
Lab Tracking #: I311052-02
Sampling Date/Time: 11/14/13 13:55

<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analyzed</u>	<u>Analyst</u>
TCLP Arsenic	< 0.05	mg/L	1311/6020A	11/29/2013	RP
TCLP Barium	0.32	mg/L	1311/6020A	11/29/2013	RP
TCLP Cadmium	0.06	mg/L	1311/6020A	11/29/2013	RP
TCLP Chromium	< 0.05	mg/L	1311/6020A	11/29/2013	RP
TCLP Lead	< 0.05	mg/L	1311/6020A	11/29/2013	RP
TCLP Mercury	< 0.01	mg/L	1311/6020A	11/29/2013	RP
TCLP Selenium	< 0.05	mg/L	1311/6020A	11/29/2013	RP
TCLP Silver	< 0.05	mg/L	1311/6020A	11/29/2013	RP

ND = Not Detected
All solids are reported on a dry weight basis unless otherwise noted.



G. Ryan Pattie
Laboratory Director

IAS EnviroChem
3314 Pole Line Rd. • Pocatello, ID 83201
Phone: (208) 237-3300 • Fax: (208) 237-3336
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Login Report

Customer Name: **Kase Warbonnet Inc.**
1477 Thunderbolt
Pocatello, ID 83204

Work Order #: **I311052**

Contact Name: **Mark R. Smith**

Comment:

Sample Description:	111413-SDL	Sampling Date/Time:	11/14/13 13:40
Lab Tracking #:	I311052-01		
Matrix:	Water	Date Received:	11/14/13 14:25
Sample Notes:			

<u>Test</u>	<u>Method</u>	<u>Due</u>
pH	150.1	11/28/13
TCLP Arsenic	1311/6020A	11/28/13
TCLP Barium	1311/6020A	11/28/13
TCLP Cadmium	1311/6020A	11/28/13
TCLP Chromium	1311/6020A	11/28/13
TCLP Lead	1311/6020A	11/28/13
TCLP Mercury	1311/6020A	11/28/13
TCLP Selenium	1311/6020A	11/28/13
TCLP Silver	1311/6020A	11/28/13

Sample Description:	111413-SDS	Sampling Date/Time:	11/14/13 13:55
Lab Tracking #:	I311052-02		
Matrix:	Solid	Date Received:	11/14/13 14:25
Sample Notes:			

<u>Test</u>	<u>Method</u>	<u>Due</u>
TCLP Arsenic	1311/6020A	11/28/13
TCLP Barium	1311/6020A	11/28/13
TCLP Cadmium	1311/6020A	11/28/13
TCLP Chromium	1311/6020A	11/28/13
TCLP Lead	1311/6020A	11/28/13
TCLP Mercury	1311/6020A	11/28/13
TCLP Selenium	1311/6020A	11/28/13
TCLP Silver	1311/6020A	11/28/13

Sample Condition Record

Samples received in a cooler?	No
Samples received intact?	Yes
The temperature recorded?	19.8
Samples received with a COC?	Yes
Samples received within holding time?	Yes
Are all samples properly preserved?	Yes
Labels and chain agree?	Yes

1311052

Kase Warbonnet Inc.

Received: 11/14/2013

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2 Samples

IAS EnviroChem - 3314 Pole Line Rd • Pocatello, ID 83201
237-3100 F: (208) 237-3336 • Email: iasenvirochem.com

Company Name KASE/WARBONNIE		Special Instructions													
Address 1477 Thunderbolt															
City Pecatonica IL 62321															
Phone 208-232-6226															
Email															
Send Bill or Receipt To: KASE/WARBONNIE															
Payment due with samples unless credit has been established															
Email Invoice to:															
<input type="checkbox"/> Cash <input type="checkbox"/> Bill <input type="checkbox"/> Check# _____ <input type="checkbox"/> PO# _____ <input type="checkbox"/> Other _____ Received by _____ Amount _____															
Number of Containers TCP HD															
SAMPLE INFORMATION <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">TIME (Lab use)</th> <th style="text-align: left;">Sample Description</th> <th style="text-align: left;">Date/Time Collected</th> </tr> </thead> <tbody> <tr> <td>11/14/13</td> <td>5 PCL</td> <td>11/14/13 1340</td> </tr> <tr> <td>11/14/13</td> <td>5 sets</td> <td>11/14/13 1355</td> </tr> <tr> <td>11/14/13</td> <td>SDS</td> <td>11/14/13 1355</td> </tr> </tbody> </table>				TIME (Lab use)	Sample Description	Date/Time Collected	11/14/13	5 PCL	11/14/13 1340	11/14/13	5 sets	11/14/13 1355	11/14/13	SDS	11/14/13 1355
TIME (Lab use)	Sample Description	Date/Time Collected													
11/14/13	5 PCL	11/14/13 1340													
11/14/13	5 sets	11/14/13 1355													
11/14/13	SDS	11/14/13 1355													
RELINQUISHED BY Signature  Printed Name Allen Gau Date/Time 11/14/13 1425		RECEIVED BY Signature KBC Printed Name Kase Date/Time 11/14/13 1425													
Comments <div style="border: 1px solid black; height: 100px; width: 100%;"></div>		Analyses Requested <div style="border: 1px solid black; height: 100px; width: 100%;"></div>													
		Lab Use Only 19.8 C Temp _____ Labels and Chain Agree? <input checked="" type="checkbox"/> YES Container Sealed? <input checked="" type="checkbox"/> YES 													

DVD of Stormwater Sewer Piping Video Survey
(included in Hard Copy Reports Only)

APPENDIX H

ProUCL 5.0 Statistical Analysis

Normal Background Statistics for Full Data Sets**User Selected Options**

From File	C:\Users\hartmanrj\Documents\FMC Projects\RD Work Plans\Data Gap WP\Field Data\Geotech data for
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Full Precision	OFF
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Confidence Coefficient	95%
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Coverage	90%
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Different or Future K Values	1
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MDD

Raw Statistics

Number of Valid Observations	10
Number of Distinct Observations	10
Minimum	97.7
Maximum	107.2
Second Largest	107
Mean	104.2
Geometric Mean	104.1
First Quartile	103.8
Median	104.6
Third Quartile	106.8
SD	3.215
Coefficient of Variation	0.0309
Skewness	-1.211

Normal Distribution Test

Shapiro Wilk Test Statistic	0.843
5% Shapiro Wilk Critical Value	0.842

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

90% Percentile (z)	108.3
95% Percentile (z)	109.5
99% Percentile (z)	111.7
Tolerance Factor K	2.355
95% UTL with 90% Coverage	111.8
95% UPL (t)	110.4

Average K

Raw Statistics

Number of Valid Observations	6
Number of Distinct Observations	6
Minimum	2.3000E-5
Maximum	1.4000E-4
Second Largest	7.8000E-5
Mean	6.5667E-5
Geometric Mean	5.5682E-5

First Quartile	3.9250E-5
Median	6.0000E-5
Third Quartile	7.4000E-5
SD	4.1563E-5
Coefficient of Variation	N/A
Skewness	1.252

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Normal Distribution Test

Shapiro Wilk Test Statistic	0.901
5% Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

90% Percentile (z)	1.1893E-4
95% Percentile (z)	1.3403E-4
99% Percentile (z)	1.6236E-4

Tolerance Factor K	3.006
95% UTL with 90% Coverage	1.9060E-4

95% UPL (t)	1.5613E-4
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In-situ Moisture

Raw Statistics

Number of Valid Observations	9
Number of Distinct Observations	9
Minimum	4.8
Maximum	15.5
Second Largest	15.1
Mean	8.733
Geometric Mean	7.987
First Quartile	5.9
Median	8.4
Third Quartile	9.4
SD	4.071
Coefficient of Variation	0.466
Skewness	0.972

Normal Distribution Test

Shapiro Wilk Test Statistic	0.839
5% Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

90% Percentile (z)	13.95
95% Percentile (z)	15.43
99% Percentile (z)	18.2
Tolerance Factor K	2.454
95% UTL with 90% Coverage	18.72
95% UPL (t)	16.71

In-situ Density**Raw Statistics**

Number of Valid Observations	9
Number of Distinct Observations	9
Minimum	70.4
Maximum	94.7
Second Largest	90.8
Mean	81.11
Geometric Mean	80.82
First Quartile	77.5
Median	79.3
Third Quartile	81.7
SD	7.368
Coefficient of Variation	0.0908
Skewness	0.825

Normal Distribution Test

Shapiro Wilk Test Statistic	0.895
5% Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level**Background Statistics Assuming Normal Distribution**

90% Percentile (z)	90.55
95% Percentile (z)	93.23
99% Percentile (z)	98.25
Tolerance Factor K	2.454
95% UTL with 90% Coverage	99.19
95% UPL (t)	95.55

Optimum Moisture**Raw Statistics**

Number of Valid Observations	10
Number of Distinct Observations	9
Minimum	15.9
Maximum	22.7
Second Largest	19.4

Mean	17.65
Geometric Mean	17.56
First Quartile	16.65
Median	16.85
Third Quartile	17.65
SD	2.024
Coefficient of Variation	0.115
Skewness	2.059

Normal Distribution Test

Shapiro Wilk Test Statistic	0.756
5% Shapiro Wilk Critical Value	0.842

Data not Normal at 5% Significance Level**Background Statistics Assuming Normal Distribution**

90% Percentile (z)	20.24
95% Percentile (z)	20.98
99% Percentile (z)	22.36
Tolerance Factor K	2.355
95% UTL with 90% Coverage	22.42
95% UPL (t)	21.54

Optimum Moisture w/o outlier**Raw Statistics**

Number of Valid Observations	9
Number of Distinct Observations	8
Minimum	15.9
Maximum	19.4
Second Largest	17.7
Mean	17.09
Geometric Mean	17.06
First Quartile	16.6
Median	16.8
Third Quartile	17.5
SD	1.033
Coefficient of Variation	0.0604
Skewness	1.473

Normal Distribution Test

Shapiro Wilk Test Statistic	0.877
5% Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level**Background Statistics Assuming Normal Distribution**

90% Percentile (z)	18.41
95% Percentile (z)	18.79
99% Percentile (z)	19.49

Tolerance Factor K	2.454
95% UTL with 90% Coverage	19.62
95% UPL (t)	19.11

User Selected Options		Outlier Tests for Selected Variables					
From File	C:\Users\hartmanrj\Documents\FMC Projects\RD Work Plans\Data Gap WP\Field Data\Geot						
Full Precision	OFF						
Test for Suspected Outliers with Dixon test	1						
Test for Suspected Outliers with Rosner test	1						
Dixon's Outlier Test for Optimum Moisture							
Number of data = 10							
10% critical value: 0.409							
5% critical value: 0.477							
1% critical value: 0.597							
1. Data Value 22.7 is a Potential Outlier (Upper Tail)?							
Test Statistic: 0.508							
For 10% significance level, 22.7 is an outlier.							
For 5% significance level, 22.7 is an outlier.							
For 1% significance level, 22.7 is not an outlier.							
2. Data Value 15.9 is a Potential Outlier (Lower Tail)?							
Test Statistic: 0.086							
For 10% significance level, 15.9 is not an outlier.							
For 5% significance level, 15.9 is not an outlier.							
For 1% significance level, 15.9 is not an outlier.							

Normal Background Statistics for Full Data Sets**User Selected Options**

From File	C:\Users\hartmanrj\Documents\FMC Projects\RD Work Plans\Data Gap WP\Field Data\Root density data
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Full Precision	OFF
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Confidence Coefficient	95%
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Coverage	90%
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Different or Future K Values	1
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0 to 6 inches

Raw Statistics

Number of Valid Observations	27
Number of Distinct Observations	27
Minimum	0.014
Maximum	0.118
Second Largest	0.109
Mean	0.067
Geometric Mean	0.0598
First Quartile	0.0445
Median	0.068
Third Quartile	0.088
SD	0.0285
Coefficient of Variation	0.425
Skewness	-0.0498

Normal Distribution Test

Shapiro Wilk Test Statistic	0.973
5% Shapiro Wilk Critical Value	0.923

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

90% Percentile (z)	0.103
95% Percentile (z)	0.114
99% Percentile (z)	0.133
Tolerance Factor K	1.811
95% UTL with 90% Coverage	0.119
95% UPL (t)	0.116

12 to 18 inches

Raw Statistics

Number of Valid Observations	25
Number of Distinct Observations	13
Minimum	0.003
Maximum	0.026
Second Largest	0.023
Mean	0.014
Geometric Mean	0.0125

First Quartile	0.013
Median	0.014
Third Quartile	0.016
SD	0.00553
Coefficient of Variation	0.396
Skewness	-0.11

Normal Distribution Test

Shapiro Wilk Test Statistic	0.946
5% Shapiro Wilk Critical Value	0.918

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

90% Percentile (z)	0.021
95% Percentile (z)	0.023
99% Percentile (z)	0.0268

Tolerance Factor K	1.838
95% UTL with 90% Coverage	0.0241

95% UPL (t)	0.0236
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Gamma Background Statistics for Full Data Sets

User Selected Options

From File	C:\Users\hartmanr\Documents\FMC Projects\RD Work Plans\Data Gap WP\Field Data\Root density data
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Number of Bootstrap Operations	2000

6 to 12 inches

Raw Statistics

Number of Valid Observations	26
Number of Distinct Observations	21
Minimum	0.013
Maximum	0.078
Second Largest	0.075
Mean	0.0337
Geometric Mean	0.0304
First Quartile	0.0223
Median	0.0295
Third Quartile	0.0395
SD	0.0167

Gamma Distribution Test

k hat (MLE)	5.026
k star (bias corrected MLE)	4.472
Theta Hat (MLE)	0.0067
Theta star (bias corrected MLE)	0.00753
nu hat (MLE)	261.4
nu star (based upon bias corrected estimates)	232.5
MLE Mean (based upon bias corrected estimates)	0.0337
MLE Sd (based upon bias corrected estimates)	0.0159
95% Percentile of Chisquare (2k)	16.84

A-D Test Statistic	0.497
5% A-D Critical Value	0.746
K-S Test Statistic	0.137
5% K-S Critical Value	0.172

Data appear Gamma Distributed at 5% Significance Level

Background Statistics Assuming Gamma Distribution

90% Percentile	0.055
95% Percentile	0.0634
99% Percentile	0.0812

95% Wilson Hilmerty (WH) Approx. Gamma UPL	0.0643
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0648

Tolerance Factor K	1.824
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95% Wilson Hilmerty (WH) Approx. Gamma UTL with 90% Coverage

95% Hawkins Wixley (HW) Approx. Gamma UTL with 90% Coverage

Nonparametric Background Statistics

95% Chebyshev UPL	0.108
95% BCA Bootstrap UTL with 90% Coverage	0.075
95% Bootstrap (%) UTL with 90% Coverage	0.0765

0 to 12 inches

Raw Statistics

Number of Valid Observations	53
Number of Distinct Observations	44
Minimum	0.013
Maximum	0.118
Second Largest	0.109
Mean	0.0506
Geometric Mean	0.0429
First Quartile	0.028
Median	0.041
Third Quartile	0.075
SD	0.0287

Gamma Distribution Test

k hat (MLE)	3.169
k star (bias corrected MLE)	3.002
Theta Hat (MLE)	0.016
Theta star (bias corrected MLE)	0.0169
nu hat (MLE)	335.9
nu star (based upon bias corrected estimates)	318.2
MLE Mean (based upon bias corrected estimates)	0.0506
MLE Sd (based upon bias corrected estimates)	0.0292
95% Percentile of Chisquare (2k)	12.6
A-D Test Statistic	0.602
5% A-D Critical Value	0.757
K-S Test Statistic	0.088
5% K-S Critical Value	0.123

Data appear Gamma Distributed at 5% Significance Level**Background Statistics Assuming Gamma Distribution**

90% Percentile	0.0898
95% Percentile	0.106
99% Percentile	0.142

95% Wilson Hilmerty (WH) Approx. Gamma UPL	0.107
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.109

Tolerance Factor K	1.628
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95% Wilson Hilmerty (WH) Approx. Gamma UTL with 90% Coverage	0.104
95% Hawkins Wixley (HW) Approx. Gamma UTL with 90% Coverage	0.106

Nonparametric Background Statistics

95% Chebyshev UPL	0.177
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95% BCA Bootstrap UTL with 90% Coverage	0.103
95% Bootstrap (%) UTL with 90% Coverage	0.104

FMC Corporation
1735 Market Street
Philadelphia PA 19103

FMC Corporation

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Transmitted Via E-mail & Federal Express

January 28, 2014

Kevin Rochlin
Project Coordinator
U. S. Environmental Protection Agency
1200 Sixth Avenue, Suite 900
Seattle, WA 98101

Re: FMC Corporation Pocatello, ID
Unilateral Administrative Order for Remedial Design and Remedial Action
EPA Docket No. CERCLA 10-2013-0116
Data Gap Report

Dear Mr. Rochlin,

The purpose of this letter is to transmit to EPA the Data Gap Report as specified in the EPA approved Data Gap Work Plan. The field work was completed between October 29, 2013 and November 13, 2013 and the final geotechnical testing laboratory reports were received on January 15, 2014.

Sincerely,



Barbara E. Ritchie
Associate Director, Environment

Enclosure (4 copies)

cc (as required under the UAO):
Bruce Olenick, Idaho Department of Environmental Quality (2 copies)
Kelly Wright, Shoshone-Bannock Tribes (1 copy)
Susan Hanson, Shoshone-Bannock Tribes (1 copy)

